THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CIX. No. 2440.] LONDON, FEBRUARY 15, 1910. [62ND YEAR. PRICE 6d.

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GOODMAN SAFETY GAS-MAIN STOPPERS, for Shutting off Gas in Mains temporarily during Alterations and Repairs.
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For Ammonia Joints.
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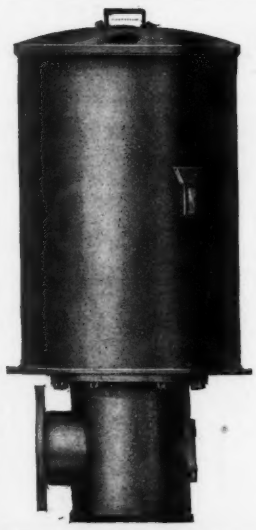

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THESE Governors are made to prevent fluctuation in the Pressure or Exhaust in the Hydraulic Main by controlling the Gas entering the Governor, notwithstanding the constant varying quantity of Gas coming from the Retorts. This enables the Seal of the Dip Pipes to be reduced to a minimum with perfect safety, and an increase in the make of Gas per Ton of Coal is thereby assured.

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Make them into **NEW ONES** with the

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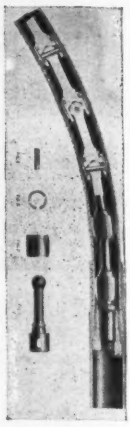
After the Grease is removed, Stoves can be Cleaned and Polished *equal to New*. With a saving of at least **75** per cent. of the usual Cost.



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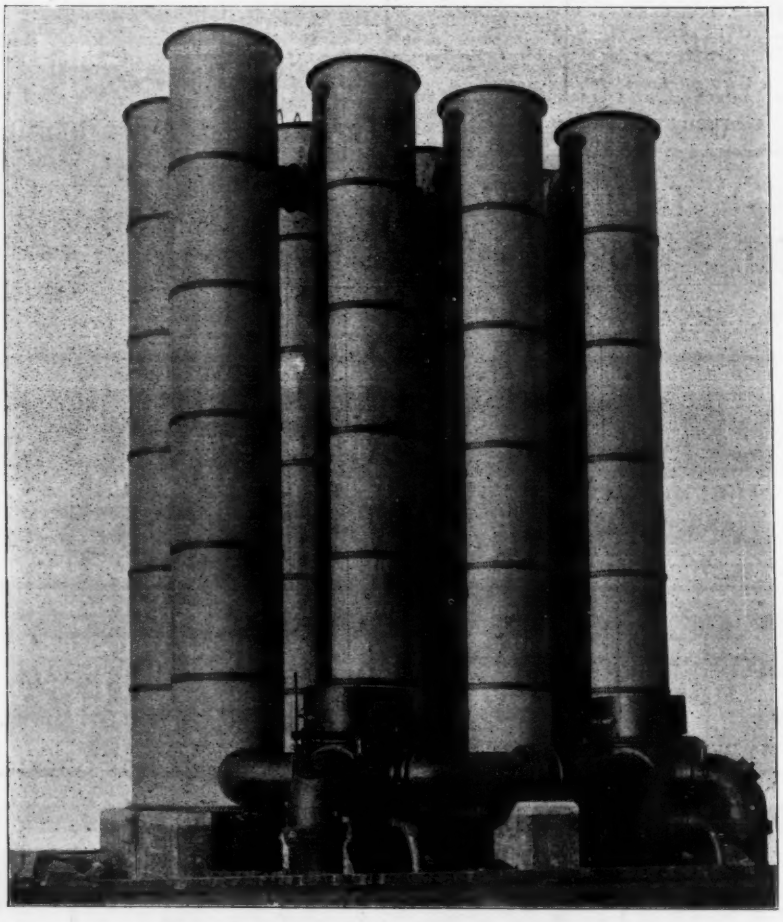

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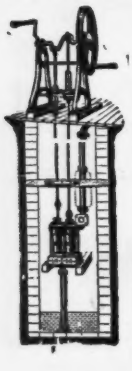

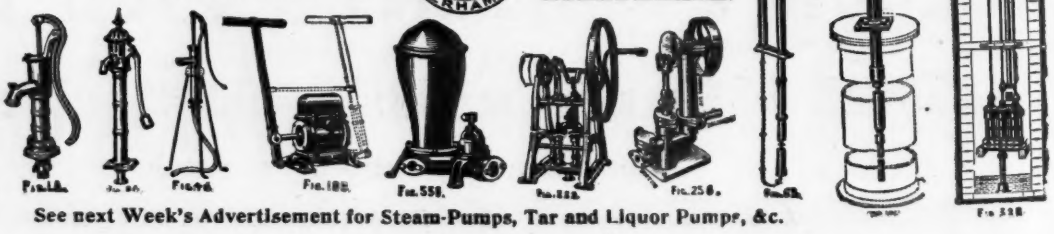

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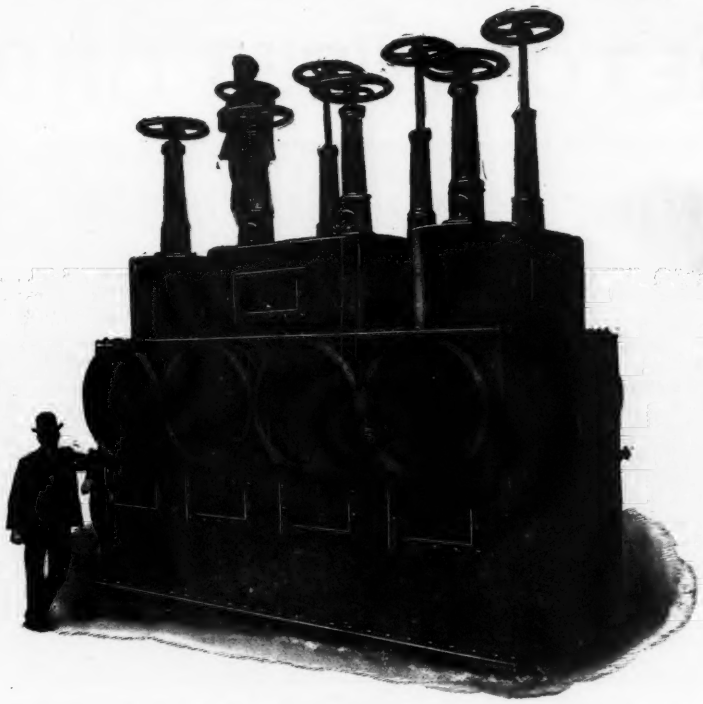

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GAS APPARATUS OF EVERY DESCRIPTION.

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ENSURES ABSOLUTE SECURITY AGAINST THEFT.

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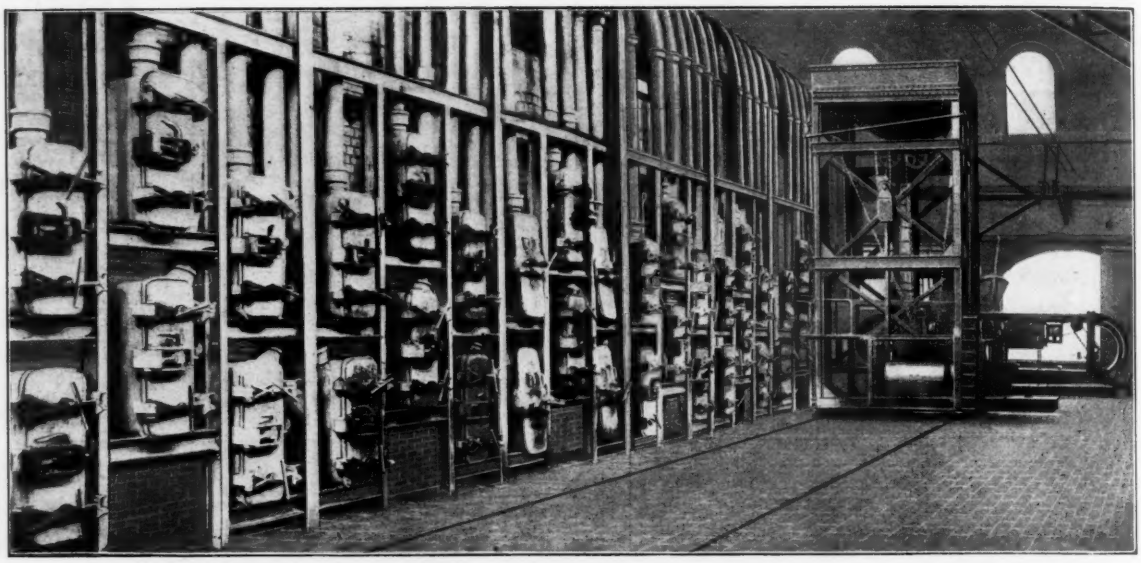

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GAS RESULTS, **13,600** cub. ft. of **14·5** c.p. gas per Ton of coal carbonized.

COKE, **GREY, DENSE,** and **MASSIVE,** suitable for many metallurgical purposes and for malting.

OPERATING COSTS considerably lowered owing to greatly reduced number of operations.

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Complete with "NICO" Patent Gas Regulators.

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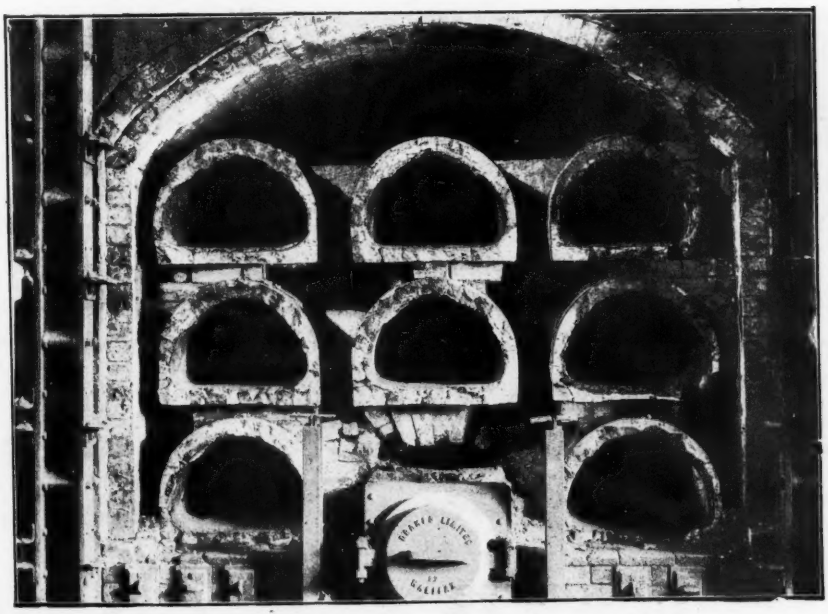

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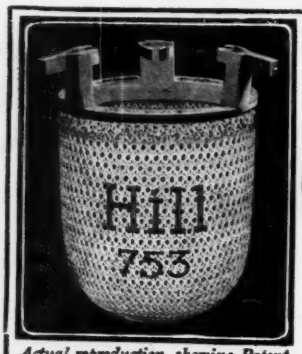

Actual reproduction, showing Patent Beehive Knitting used for Upright and Inverted Types.

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MANTLE MANTLE

Upright or Inverted. For Street Lighting, for Railways, for Shopkeepers, and Manufactories, wherever there is need for Mantles that are superior in all respects.

Hill Mantles are entirely distinct from others. The fabric is patented, the impregnation is of special character.

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The Inverted Burner has met with great success, but it has by no means

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200, 400, and 700-candle power from a single mantle, with gas at its usual pressure, and with the lowest consumption on record.

No high pressure required.

SIMPLE. BRILLIANT. RELIABLE.

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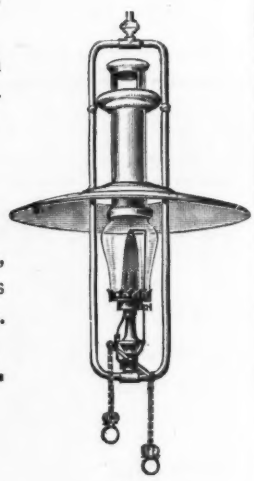

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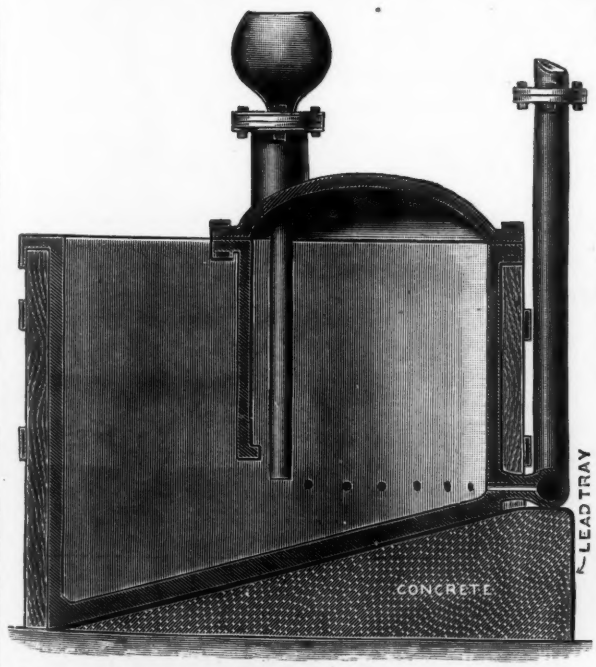

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Williams' and Fenner's Patent Saturator with Outside Cracker Pipe, having the following

ADVANTAGES:—

1. **Equal distribution of Steam and Ammonia.**
2. **Perfect agitation and boiling of the Acid Liquor.**
3. **No possibility of local Alkalinity.**
4. **Consequently no formation of Blue Salt.**
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8. **Capacity of output greatly increased.**

IT CAN BE APPLIED TO ANY EXISTING SATURATOR.

LICENCES TO MAKE MAY BE OBTAINED.

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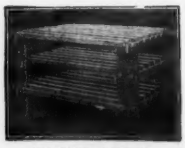
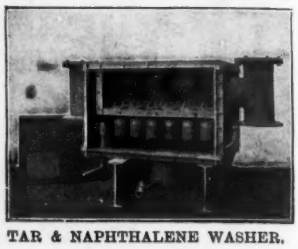


"RACK" GRIDS.



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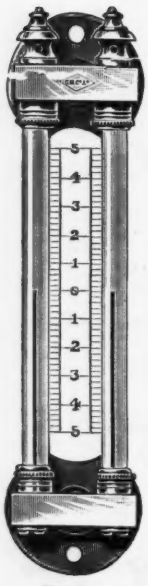

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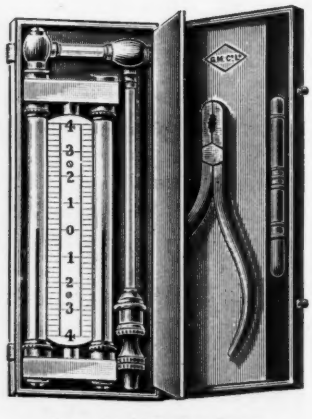

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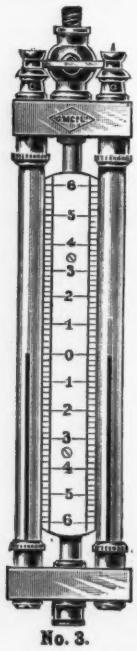

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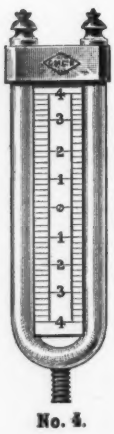

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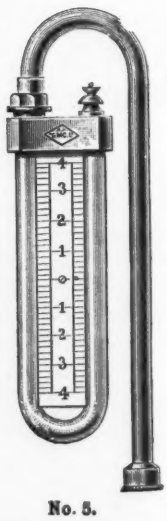

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MOBBERLEY & PERRY, Ltd., of STOURBRIDGE,

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VERTICAL, INCLINED, HORIZONTAL, & SEGMENTAL

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Allenstein, Germany	200,000	Frankenthal, Germany	175,000	Posen, Germany	450,000
Antwerp, Belgium	1,500,000	G. L. & C. Co. Beckton	2,250,000	Posen (2nd)	700,000
Antwerp (2nd)	1,000,000	G. L. & C. Co., ,, (2nd)	10,750,000	Prague, Austria	140,000
Ashford	250,000	G. L. & C. Co., Bromley	3,750,000	Preston	1,400,000
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Belfast	1,700,000	Gelsenkirchen, Westphalia	175,000	Revel, Russia	350,000
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Berlin—Charlottenburg	2,500,000	Gosport	200,000	Romford (2nd)	350,000
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Berlin—Rixdorf (2nd)	700,000	Göteborg (2nd)	600,000	Rotterdam (2nd)	1,500,000
Berlin—Tegel	3,500,000	Graudenz, Prussia	200,000	Rotterdam (3rd)	750,000
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Bilston	375,000	Guildford (2nd)	200,000	Rotterdam (5th)	600,000
Birmingham	1,500,000	Haarlem, Holland	850,000	St. Albans	700,000
Bishop's Stortford	200,000	Hamburg, Germany	1,750,000	St. Gallen, Switz.	225,000
Bochum, Westphalia	530,000	Hampton Court	500,000	St. Gallen (2nd)	225,000
Bognor	100,000	Hampton Court (2nd)	600,000	St. Joseph, Mo.	750,000
Bordentown, N.J.	125,000	Hartlepool	750,000	San Paulo, Brazil	700,000
Bournemouth	1,000,000	Hebden Bridge	200,000	Santiago de Cuba	400,000
Bournemouth (2nd)	500,000	Heidelberg, Germany	200,000	Scarborough	800,000
Bremen, Germany	550,000	Holyoke, Mass.	600,000	Schwelm, Westphalia	100,000
Bremen (2nd)	950,000	Hong Kong	450,000	Shanghai	225,000
Bremen (3rd)	850,000	Hull	1,500,000	Shanghai (2nd)	225,000
Brentford	1,200,000	Ilford	650,000	Shanghai (3rd)	1,600,000
Brentford (2nd)	850,000	Innsbruck, Austria	200,000	Southampton	800,000
Bridgwater	200,000	Ipswich	750,000	Southampton (2nd)	500,000
Bridlington	150,000	Kampen, Holland	350,000	Southampton (3rd)	600,000
Bridlington (2nd)	200,000	Kiel, Sleswig	1,000,000	Southgate	400,000
Brieg, Silesia	100,000	Kiel (2nd)	880,000	Southport	750,000
Brighton	1,750,000	L. & N.W. Rly., Crewe	700,000	Southport (2nd)	900,000
Brighton (2nd)	1,850,000	Lausanne, Switz.	250,000	South Shields	650,000
Bromley	1,500,000	Lawrence, Mass.	400,000	Stafford	500,000
Bruges, Belgium	200,000	Lea Bridge	350,000	Staines	600,000
Brussels—Anderlecht	350,000	Lea Bridge (2nd)	350,000	Stettin, Germany	880,000
Brussels—Anderlecht (2nd)	350,000	Lea Bridge (3rd)	400,000	Stockholm	1,500,000
Brussels—Forest	1,000,000	Lea Bridge (4th)	1,000,000	Stockholm (2nd)	1,750,000
Brussels—Koekelberg	1,000,000	Leeuwarden, Holland	400,000	Stockport	600,000
Brussels—St. Gilles	1,000,000	Leiden, Holland	500,000	Stockport (2nd)	600,000
Brussels—St. Josse	1,000,000	Leiden (2nd)	575,000	Stockport (3rd)	400,000
Brussels—St. Josse (2nd)	600,000	Leigh, Lancs.	350,000	Stockton-on-Tees	500,000
Brussels—Ville	750,000	Lemberg, Galicia	260,000	Swansea	750,000
Brussels—Ville (2nd)	750,000	Lemberg (2nd)	500,000	Swansea (2nd)	1,000,000
Brussels—Ville (3rd)	1,500,000	Liége, Belgium	1,000,000	Swansea (3rd)	450,000
Brussels—Ville (4th)	350,000	Liége (2nd)	750,000	Swindon	300,000
Bucarest, Roumania	1,100,000	Lincoln	500,000	Sydney—Harbour	500,000
Budapest, Hungary	50,000	Liverpool	3,500,000	Sydney—Harbour (2nd)	500,000
Budapest (2nd)	1,750,000	Liverpool (2nd)	4,500,000	Sydney—Mortlake	500,000
Carlisle	600,000	Longton	600,000	Sydney—Mortlake (2nd)	500,000
Carlsruhe, Germany	500,000	Louvain, Belgium	800,000	Syracuse, N.Y.	850,000
Chigwell	350,000	Lübeck, Germany	400,000	Taunton	225,000
Chorley	300,000	Maastricht, Holland	200,000	Taunton (2nd)	350,000
Commercial, London	850,000	Magdeburg, Germany	1,400,000	The Hague Holland	1,000,000
Commercial (2nd)	850,000	Maidenhead	225,000	The Hague (2nd)	500,000
Commercial (3rd)	1,250,000	Maidenhead (2nd)	225,000	Tilburg, Holland	400,000
Commercial (4th)	2,000,000	Maidstone	500,000	Torquay	350,000
Copenhagen	700,000	Malines, Belgium	500,000	Tottenham	750,000
Copenhagen (2nd)	2,500,000	Malmö, Sweden	350,000	Tottenham (2nd)	750,000
Courtral, Belgium	250,000	Malta	400,000	Tottenham (3rd)	350,000
Coventry	600,000	Manchester	3,500,000	Tottenham (4th)	1,000,000
Coventry (2nd)	600,000	Manchester (2nd)	3,500,000	Tottenham (5th)	1,000,000
Cracow, Galicia	200,000	Marlborough	100,000	Tottenham (6th)	1,250,000
Cracow (2nd)	200,000	Mayence, Germany	700,000	Tunbridge Wells	1,000,000
Crefeld, Germany	500,000	McKeesport, Pa.	500,000	Utrecht, Holland	1,000,000
Croydon	1,250,000	Merthyr Tydfil	300,000	Utrecht (2nd)	1,000,000
Croydon (2nd)	625,000	Middlesbrough	1,250,000	Verviers, Belgium	1,000,000
Croydon (3rd)	625,000	Namur, Belgium	175,000	Vienna	3,500,000
Croydon (4th)	550,000	Nelson	400,000	Vienna (2nd)	2,500,000
Debreczin, Hungary	100,000	Newburgh, N.Y.	600,000	Waltham	400,000
Deventer, Holland	150,000	New York	5,200,000	Wandsworth & Putney	1,800,000
Deventer (2nd)	200,000	Nictheroy, Brazil	250,000	Watford	300,000
Dorking	150,000	North Middlesex	150,000	Watford (2nd)	350,000
Dublin	2,000,000	North Middlesex (2nd)	200,000	Wellington, N.Z.	350,000
Dublin (2nd)	2,000,000	North Middlesex (3rd)	75,000	West Bromwich	550,000
Dublin (3rd)	650,000	Norwich	1,000,000	West Ham	1,500,000
Dundee	1,500,000	Norwich (2nd)	300,000	West Ham (2nd)	800,000
Dunedin, N.Z.	150,000	Norwich (3rd)	500,000	Weston-super-Mare	350,000
Dunedin, N.Z. (2nd)	275,000	Nottingham	1,000,000	Weston (2nd)	350,000
Durham	200,000	Nottingham (2nd)	1,000,000	Wexford, Ireland	100,000
Düsseldorf, Germany	1,000,000	Nuneaton	125,000	Wiesbaden, Germany	850,000
Eastbourne	1,250,000	Oberhausen, Germany	175,000	Winchester	225,000
Edinburgh	2,000,000	Oldenburg, Germany	200,000	Winchester (2nd)	125,000
Epsom	225,000	Ostend, Belgium	100,000	Wolverhampton	1,500,000
Epsom (2nd)	300,000	Ostend (2nd)	200,000	Zwolle, Holland	200,000
Falmouth	150,000	Perth, W.A.	125,000	Zwolle (2nd)	200,000

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EDITORIAL NOTES—GAS, &c.

The Commercial Pressure of the Times.

"THE half year has been progressive rather than eventful." These words were employed by Mr. Charles Carpenter in the early part of his address from the chair at the crowded meeting of the proprietors of the South Metropolitan Gas Company last Wednesday; and they correctly and pithily sum up the period's history of the gas industry. At the same time, the fact does not detract from the interesting story that the Chairman had to lay before the proprietors, who by-the-by, with great enthusiasm, showed their confidence in the successor to Sir George Livesey at the helm of the undertaking by re-establishing him in office on his retirement by rotation. In these times of competition, labour unrest at the producing sources of the primary raw material required in the industries, with innovation constantly bursting out in unexpected places, there cannot be progress in the gas industry without work, and work that is both actively offensive and defensive. There can be no gainsaying that, in all commercial work, the pressure has increased, and still increases. Examples of the multifarious matters that have to occupy the direction of a gas undertaking in these days, and the indications of an imperative alertness approaching to a perpetual strain on the part of those in fiduciary positions, are presented throughout the address. The fact that an excellent increase in the consumption of gas was obtained in the past half year by the Company does not mean that there can be any relaxation in any one particular on the part of the outdoor staff or on the part of those who have to exercise their brains to keep the wheels from clogging, to keep them active, and to utilize them to fresh useful effect. These are times when it is easier to lose ground in some districts than to open up fresh; and there has to be constant watchfulness to ensure that what is won in one quarter is not lost in another. Therefore to simultaneously retain and to increase mean constant effort and application.

It was interesting to hear from the Chairman that the percentage increase (4·12) in the consumption of gas on the large business done by the Company represents in volume sufficient gas to supply towns which individually are generally regarded as representative and substantial—such as Middlesbrough, Ipswich, Eastbourne, Hastings, York, &c. The volume and the illustration forcibly appeal, while the percentage figure of 4·12 may to the lay mind seem mean on account of its proximity to a cipher. It is a point that has often been made before in our columns; and it would be, we believe, an advantage, giving as it would do a better public view of the life and fecundity in the gas industry, if, when percentage increases are named, the volumes they represent were also quoted. The administrations of the electrical industry endeavour to create a public impression by talking of their increases in terms of 8-candle power lamps connected—rolling up in the calculation not only lighting but power supply, and the little fringe of consumption that they have in other directions. That is absurd. We cannot follow them in that direction with the innumerable connections of the gas industry; and what is more we have no wish to. But the product of the calculation may be of a kind that makes a public impression.

While on the subject of the gas business, the Chairman could not refrain from reference to that quixotic project that has been planted and is struggling to take root in the Company's district, known as the Fixed Price Light Company, through whose beneficent agency the working man householder is to receive, at a fixed price per lamp per week, the supposititious privilege of low-power electric lamps, and the landlords of the property are to have a hand in the conferment of this blessing by collecting (if they can) the lamp-rents with their house rents. We commented quite recently in our "Electric Supply Memoranda" on this queer project, which has been put forward with all gravity by the electrical world, and over which the big drum has been loudly beaten by the daily press. Mr. Carpenter carries information a step further than the newspapers, and reports the degree of success attained to the present by the Fixed Price Company, which success is an indication of the extent of the attractiveness of the idea to the working-class population of South London. Never before has the outdoor staff of the South Metropolitan Gas Company been organized to the height of perfection now obtaining, and through the process of decentralization and the establishment of local offices and centres, the outdoor department has—the same as in other gas-supply territories where the system is in vogue—become a fairly reliable channel of information as to all matters transpiring that affects the business of the Company. The information is that the success so far of the Fixed Light Company is measured by the fitting up of one house, and that the show-house itself! What else could be expected from a scheme without, as indicated by us on a previous occasion, a single side of attractiveness to it for the working-class householder?

Really we cannot conceive of any body of sane business men putting the scheme forward as a feasible one. In working class houses, nothing will gain ground by supplanting the existing that does not unquestionably present greater economy, greater convenience, and greater efficiency. When (if ever) the electricians come to know the working class householder better, they will find that his position and his means compulsorily cause him to be a most exacting person in the matter of his patronage. Landlords know this better than the electricians; and the latter will have some difficulty in obtaining the co-operation of the former in their little ruse for attempting an uncommercial raid into the preserves of the gas industry. The landlords have before them the ghastly and monitive illustration of the model workmen's dwellings, in the South Metropolitan district, which were fitted for electric light, and could not find tenants until the buildings were piped, at a higher cost than would have been the case in the first place, for gas. With such a caution before them, the landlords of South London will not be parties to their own undoing by making their houses unattractive to present or prospective tenants. We should like to see the results of the treaties of the Fixed Light Company with landlords in this matter. However, it is easy to understand that a proposal of this kind—lauded, blessed, and exaggerated as it has been by the daily press—may have caused a little trepidation in the minds of a few gas shareholders whose knowledge is not equal to any critical examination of the project. Any passing alarm that may have been felt in a few instances has been turned to amusement.

The commercial pressure does not end with the sale of gas. It extends to coal purchase and transit, and to the sale of the secondary products. The forces of industrial change and strife in other quarters than the gas industry bear upon the fortunes of the latter, in common with the remainder of the country. The cost to the whole country of putting into operation the Coal Mines Regulations (Eight Hours) Act has been a tremendous one, through the commotion and disorganization to which it has given rise in the coal-fields. The private feelings to-day of those members of the Government who fathered the principle of hour-restriction for adult labour, and piloted the measure that decreed its application to the coal mines of the country—those Ministers who ridiculed and rejected the warnings of responsible expert knowledge—can be well imagined. In

every particular warnings have materialized, the dislocation of conditions has been fulfilled, and the acerbity of the relationships between coal masters and men has been increased. For these things, the Act is alone responsible. The buyers of coal in the industry—the southern ones more especially—have had to stock very heavily, and have had to closely watch the trend of events. There has been difficulty, too, in getting coal from the North that is properly picked and cleaned; and so the South Metropolitan Company—the same thing undoubtedly applies to other concerns—have had to do the best they can with the coal delivered. The Company have not done badly in the half year, with an average production of 11,762 cubic feet per ton; and there is a prospect of something better still, when the whole of the carbonization comes under the new mode of working. Then, perhaps, the Chairman will be able to withdraw the statement of which he made use twelve months ago: "While "the average quality of gas which we are able to supply by "our present method of manufacture is about 16·4 candles, "the average we should supply, if we knew how to do it, "would be 14·4 candles. Unfortunately, we do not know "how to do it." The illuminating power of the Company's gas shows recession, but admittedly not much. According to the official returns, the average during the week ending Jan. 8 was 15·75 candles, and during the week ending Jan. 15 15·78 candles, with an advance of about ¼ candle for the week ending Jan. 22. It is, however, clear that the Company are on the high road to obtaining greater advantage than hitherto from their liberty in respect of their illuminating power standard.

But, unfortunately, while the Company are gaining economic benefit through carbonization, they, with other concerns using the Thames, are menaced with a maximum due of 3d. per ton of coal (representing to the Company an increased cost of about £15,000 a year upon coal alone), through the operation of the Port of London Act, 1908. This is naturally a matter that has to be, and will be, very seriously opposed, as under their circumstances grossly unfair to the Company. But it all goes to show how new conditions that are intended to be improvements in certain respects do not always come into operation without inflicting hardship in some quarters. One point more; and this in reference to residuals. The Company have commenced cultivating a local demand for the sale of coke in small quantities, packed in 28-lb. lots in paper bags; and an encouraging beginning has been effected with a business of 200 tons per week. Looking round, it is patent on all sides that pressure of commercial conditions, on the industry's administrators and executive officers, was never greater than to-day; and nothing but the best service can suffice.

The Standard and the Practice.

THE movement of the Scottish gas undertakings to a lower illuminating power standard for their gas, slowly continues; but the reduction of standard only makes more pronounced the mistaken veneration of the gas authorities for the heavy grades of gas. In the Gas Provisional Orders reviewed to-day, there are four gas undertakings—three of them under the direction of local authorities—seeking the lowering of their prescribed illuminating power to 14 candles. They are the Dunblane Gas Company, and the Falkirk, the Glasgow, and the Kirkcaldy Corporations. Glasgow is noteworthy, as the last dropping of the standard was to 16 candles; and it is proposed to come down to the now commonly accepted level of 14 candles, which in this matter will put Glasgow in line with Edinburgh. We do not think the gas authorities of Scotland who have in recent times applied, or are now applying, for the lowering of the illuminating power standard have been, or are, actuated by a mere idle whim, nor that they intend the newly-acquired authority to remain a dead-letter. But it is a singular fact that, whereas, according to the last Board of Trade statistics, there are 36 Scotch undertakings (out of 58 making returns) with a prescribed standard of illuminating power of 14 candles, the illuminating power of the gas actually supplied by these concerns ranges between 16·25 candles and (say) 28 candles—the majority being above 20 candles. We cannot explain the reason for this, in face of all scientific teachings and proofs that such gas is most unsuitable for use in all modern applications, and that it consequently impedes rather than aids the realization of the highest efficiencies.

The point was well put by Mr. Laurence Fletcher, the Managing-Director of the Welsbach Company, in the paper he lately contributed to the Western Section of the Scottish Junior Gas Association. When incandescent lighting was in its infancy, not so much was known as now about the most appropriate conditions for obtaining the highest flame temperature from gas. Many jogged along in the mistaken belief that high illuminating power gas was best for use in incandescent burners; and partly through the persistence of this belief, incandescent gas lighting was hampered in its progress. The hampering still continues throughout Scotland. And Mr. Fletcher gives in his instructive paper a simple explanation of the reason why the policy has a disparaging effect. Gas rich in heavy hydrocarbons requires a large volume of air for its complete combustion; whereas an ideal gas for a bunsen burner is a mixture only needing 4½ volumes of air to 1 volume of gas for complete combustion, instead of (say) 6 volumes for 16 or 17 candle power coal gas. There is no insuperable difficulty in the way of making a bunsen burner that will give a good efficiency with high illuminating power gas. But, as Mr. Fletcher puts it, even with such a burner, we are placing a heavy load on the jet of sluggish gas as it issues from the bunsen tube; and, unless the burner is kept in an ideal condition, the chances are that a sufficient volume of air will not be drawn in to produce a good bunsen flame—resulting in the breakdown of the flame, a much lower flame temperature, and carbon deposit on the mantle. An ideal bunsen burner gas has, Mr. Fletcher told the Scotch juniors, an illuminating power of 12 to 14 candles. What is good for obtaining a high flame temperature in incandescent lighting is good for obtaining an excellent efficiency from gas-fires and cooking-stoves, and for realizing the best duty from a gas-engine. Why do the gas authorities of Scotland obstinately persist in blocking the way to the enjoyment of the highest efficiencies from gas when utilized in the modes approved by science? We do not know; and we fail to see whence could come an explanation that would, in these times, be accepted as satisfactory.

Calorimetric Conditions.

THE paper that Mr. P. C. Balcon read on Saturday last, before the Midland Junior Gas Engineering Association, on "Gas-Works Calorimetry" is useful, not so much in respect of any new information that it contains as for the emphasis that it lays on certain matters relating to the subject, and the clear indication that the author gives, from his own experience, that calorimetry has a right to claim, and must have for the sake of scientific accuracy, necessary precision of condition in its conduct, just in the same way as photometry. This point should not be, though it often is, overlooked. In some gas-works, testing for calorific value is conducted in the most slipshod fashion; and the results are neither just to the gas nor creditable to the observer. And yet, if properly conducted by an experienced man, whose experience will lead him to avoid error, and whose desire for accuracy will cause him to see that all the conditions are right, the calorimeter is, as a measure of gas value, much to be preferred to the photometer with all its loopholes for error, not excluding the personal element that enters so largely into both procedure and readings. Towards the end of the paper, the author dealt with certain of the conditions that are necessary for securing scientific accuracy in calorimetry; and, among his points, he insists on the necessity for maintaining the temperatures of the water at a fairly equable level—a temperature at as near as possible that of the atmosphere. This was a point that was made in the report of a Committee of the American Gas Institute who were deputed to consider the general subject, and whose report was dealt with in the "JOURNAL" for the 1st inst. The Committee showed that, with any considerable divergencies between room temperatures and water temperatures, there would be considerable errors. If the water temperature is within 5° of the temperature of the atmosphere of the room, the readings should be within 1 B.Th.U. of the true heating value of the gas, provided, of course, that everything else is right. This is merely an example of a necessary condition to accuracy.

It has before been remarked in these columns that one argument in favour of the calorific power test is that it is the one that is best representative of the purposes to which the bulk of town gas is now applied. And that reason is by no means a solitary one. As Mr. Balcon rightly says, the calorific value of gas is easier to maintain than illuminating power, given fairly constant composition. Carbon dioxide occasions less trouble with calorific power than with illuminating power. Above a certain gas production from the coal

carbonized, illuminating power drops very rapidly, while the calorific power exhibits only a slow decline. These are points that have had conclusive proof on the large scale in the results of working with the Dessau vertical retorts in Germany and with the heavy-charge chamber settings. Though everything is favourable to a calorific power, as opposed to an illuminating power, standard test, we must, as a point of equity, ask all who have the best interests of the industry at heart not, directly or indirectly, to favour the dual penalty test. In his paper we have Mr. Balcon saying that the limits which have been put in the Act of the Gaslight and Coke Company with regard to calorific value, give little cause for apprehension and for the outcry against the double penalty. We want to give those—and they are not the friends of the gas industry—who desire a double penalty standard as little support for it as possible from within the industry itself. There is no apprehension that the Gaslight Company will not keep clear of penalty in relation to calorific power. But a double penalty-valuation for any one commodity is indefensible, and repugnant to comfortable and economical working; and it ought not, and must not, be accepted in any submissive spirit as an inevitable condition. Beyond this there is no desire to see the voluntarily agreed standard of the Gaslight and Coke Company, with all its conditional embroidery (necessitated by the refusal of the Company to accept the standard proposed by the County Council without relaxation), become as it were standardized by further application. As a standard without the conditions, it is altogether too high; and with conditions, it would be well to have a little more freedom. Mr. Balcon described certain of the best known types of calorimeters, and made practical comments upon them. Professor Boys will no doubt note the criticisms as to suggested disadvantages in certain details of the instrument bearing his name.

Hopes of Peace—Asking for Repeal.

A FEELING of relief has gone through the country that the miners of, at all events, one of the two great coal-producing counties in the North have, on a ballot, voted against a strike, proposed with a view of destroying the agreement arrived at by their leaders with the coalowners, and consequently the three-shift system. In Northumberland, there are no less than 77 collieries; and from these the numbers voting have been substantial. The majority decision, of course, has given anything but satisfaction in the disaffected areas, where the voluntarily idle workmen, to the number of 10,000, announce, through their leaders, their intention of making themselves martyrs to the cause by still holding out. A ballot in Durham has not yet been taken; but it is confidently expected that it will end in the same vote for a peaceful solution of difficulties, instead of one for recourse being had to the arbitrament of war, which could only result in a trial of endurance, in which the victors would, in the result, naturally gain most. The outcome of the Northumberland vote will, of course, influence that in Durham. The miners are shrewd enough to know that there is some amount of truth in the ancient aphorism that "United we Stand; Divided we Fall." And Durham without Northumberland, or *vice versâ*, in such a matter is unthinkable. We should be glad to feel that these ballots were going to end the long train of disputes that have arisen since the Act came into force; but we cannot do so while the Act remains. It is, however, a curious reflection upon the measure that, conceived and born in the interests of the miners, it should have been the cause of so many, and so considerable, grievances on their part. The dogma of the Trades Unions will not necessarily stand the test of practical laws and needs; nor is it likely that policy framed by limited knowledge—knowledge so limited that it is not equal to making an analytical examination of the reasons for, and the effects of, the policy—will be the best, unless it be so by pure chance. There is a growing recognition among the men that the Act is not to them all they expected it would be; and there have been mass meetings at which there has positively been a call for repeal. At the meeting of the River Tyne Commission the other day, it was urged that there ought to be an amendment of the Act; and at the Great Western Railway Company's meeting, the Chairman (Viscount Churchill) spoke of a strong feeling in the Welsh district in favour of repeal. Coalowners and men, industries generally, railway and shipping companies, and the public are all suffering from the Act. The German owners, too, are effectively competing with us from the Westphalian coal-fields while there is so much disturbance at home. It is their opportunity. On all grounds and for all reasons—economic and peaceful—the pernicious thing should be, as early as possible, ruled from the Statute book.

From Our Australian Friends.

Judging from the bulk of manuscript delivered just as this issue of the "JOURNAL was being prepared for press, the proceedings at the annual meeting of the Victorian Gas Association, held under the presidency of Mr. P. C. Holmes Hunt, Engineer of the Metropolitan Gas Company of Melbourne, were plethoric in character. Unfortunately, owing to the delivery of the report having been somewhat delayed by the postal authorities, we cannot publish the full account in this issue, but must rest satisfied with the general matter, and the most important part of the proceedings (the presidential address); deferring the papers and discussions for publication in our next issue. Comments, for the same reason as that mentioned above, must also be postponed.

Belfast and Its Gas Undertaking.

A definite step in advance was taken towards the end of last year in the much debated question of the proposed gas-works extensions at Belfast, by the selection by the Gas Committee of experts to advise them on the matter. The Engineers chosen were Mr. Charles Hunt and Mr. W. R. Herring; and they were to be assisted in their task by members of two local firms of Contractors. The question of the extensions had previously been many times discussed in the Council and out of it; and wide differences of opinion manifested themselves with reference to the site that should be utilized for the erection of such works as might be deemed to be necessary. The Corporation therefore adopted the wisest course when they resolved to procure such assistance as they have now obtained. After full investigation and consideration of the points that were remitted to them, Messrs. Hunt and Herring have submitted a report to the Gas Committee which we publish practically in its entirety in another portion of to-day's issue. This deals fully with the seven questions on which the Committee were desirous of having opinions expressed; and the conclusions arrived at will do much to help the Council out of the difficulty in which they have hitherto felt themselves placed in connection with the matter. Briefly, the report is to the effect that urgent need exists for making provision to meet future demands for gas; the operations, even with the present consumption, being "carried on with very considerable difficulty and some danger, owing to the extremely congested condition of the works," while "the operatives are subjected to conditions which at the present day are looked upon as both unnecessary and undesirable in the operations of gas manufacture." Further, the holder accommodation is much below what is considered safe; and "it would not be possible to carry on the gas supply of Belfast with so little storage, but for the large production of carburetted water gas." In arriving at the provision which they consider should be made for the future, the reporters set forth calculations which show that between the earliest date at which new works can be completed (1914) and 1928, an additional output may be expected which would ultimately call for a further productive capacity of some 10 million cubic feet per day. This is including the extra quality of coal gas which would have to be made in order to reduce the production of carburetted water gas to 25 per cent. of the total, as has been determined by the Committee. Another thing which they point out should be kept in view is the fact that it will doubtless be more advantageous to eventually transfer the whole of the manufacturing operations to a new site than to attempt to modernize the existing works by reconstruction. Therefore they recommend a large site, and that "a commencement be made as soon as possible by the provision of works capable of producing not less than 5 million cubic feet per diem of coal gas, and the transfer of 25 per cent. of carburetted water-gas plant; to be increased in coal-gas sections of 5 million feet, with its proportion of carburetted water-gas plant, as required." Of eight suggested sites, Messrs. Herring and Hunt have no hesitation in recommending the adoption, as being eminently suitable for gas-works purposes, of one at Twin Island. The reasons for the rejection of the Ormeau Park site, which has been so much supported and condemned, are clearly stated.

Labour in Parliament.

The Labour Party have been holding their annual conference at Newport (Mon.); but nothing has transpired thereat that has startled the country, or put any fresh complexion upon the policy of the party. It was clear that the members met in a considerably chastened spirit; for the General Election has whittled down their representation in the House of Commons. But though the size of the party is smaller, the Chairman of the Conference (Mr. Keir Hardie, M.P.) asserts that it will constitute a more potent force than ever in the House. This can only be through the equality in strength of the two major bodies, which, the Labour Party thinks, will enable them to act in a dictatorial capacity, in carrying on the agitation for special labour legislation, and in warring against capital. The Government have been cautioned from Newport that they are not to rely upon the support of the party, who are going to pursue a course of independence, wholly unfettered by alliances of any kind. The House of Lords has been found very useful in its time in connection with Imperial and domestic affairs, as well as Private Bill legislation; but the Labour Party declares that it is an anachronism, and wants to see it abolished, or as Mr. Keir Hardie picturesquely puts it, "swept into oblivion." The conference, however, refused to go so far as to vote against a second chamber of any description; but there was discontent with the outlines of the Liberal policy in dealing with the Lords. The most commonsense thing done at the conference was the rejection of a proposition to interpolate the words "and Socialist" into the title of the party. The Government will, through the conference, have learned with something approaching dismay of all that is expected of them by labour's parliamentary "representatives;" and there is no doubt they will find the party somewhat tyrannical in their demands and acts in the coming session. Among other things, the Government are expected to deal with the real causes of unemployment on the lines of the Labour Party's "Right to Work Bill," which demands the formation of a Ministry of Labour and the establishment of a 48 hours' maximum working week.

And Compulsory Levies.

Before the ordinary proceedings of the annual gathering, there was a special conference for the purpose of discussing what is doubtless a question of the very first importance to the Labour Members—that is the situation which has been created by the decision of the House of Lords in the Osborne case. This judgment, it will be remembered, was to the effect that the Amalgamated Society of Railway Servants were wrong in their contention that certain of their rules were legal which had reference to the formation of a fund for the support of Members of Parliament. Under these circumstances, it became necessary to decide upon the course to be adopted. The conference which was accordingly held for this purpose took place in private; but at its close an official statement was issued, which showed that one generally expected decision, and another which was just as generally unexpected, were arrived at. The gathering was presided over by Mr. D. J. Shackleton, M.P., who remarked that, not only did the Osborne decision touch the Labour Party as they had known it politically for the last nine years, but it also affected seriously the entire Trade Union movement. He urged that nothing less than a complete restoration to the position as it existed before the decision could be at all satisfactory to the Trade Union and the Labour movement. As an appropriate sequel to this declaration, Mr. Keir Hardie, M.P., moved the first resolution, which declared for an alteration in the definition of a Trade Union, so as to allow such bodies "to engage in the political activities they have pursued since 1868 up to the present time, provided that their members agree, and that such activities are specified in the Union's rules as part of their declared objects, as has been the case hitherto." This, which was the expected resolution, was carried unanimously. The decision of the meeting which was unexpected was that which resulted in the withdrawal of a resolution that all the affiliated organizations should "take immediate steps to form branches for the collection of voluntary contributions to a Parliamentary Election and Maintenance Fund." The withdrawal of this resolution seems at first sight a strange step, for voluntary contributions would doubtless have accomplished much of what the Labour Members desire. It has, however, been suggested as a reason that the Labour Party would be in a stronger position to secure immediate legislation without voluntary levies than with them.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 457.)

If "all is well that ends well," then last week's business on the Stock Exchange may be pronounced good. The opening day was far from promising. Markets were irregular, and for the most part weaker—Rails being in that category. But Home Government lines were better after their shake-down the week before. Tuesday brought signs of improvement; and all the leading markets were stronger, though not active. The excitable speculative quarters were, of course, keenly alive; but they are outside our purview. On Wednesday, business became more brisk, and the general tone was quite favourable. Consols and Rails advanced; and the Foreign Market was calm and confident. On Thursday, the cheerfulness and the increased activity were well maintained, and further steady advances in value were made—the cheapness of money affording an agreeable fillip. Friday was almost as good; but the Consols Market yielded somewhat, in view of impending new issues. Rails, however, continued to go ahead; and the Foreign Market was strong. The general attitude of affairs on Saturday was quite good. Consols were steady, but no higher; and the other chief departments were strong. In the Money Market, the supply was superabundantly plentiful, and short loans were on easy terms. Discount rates eased away; but they rallied before the close. The Bank of England rate was lowered to 3 per cent. on Thursday; and Berlin reduced the next day. Business in the Gas Market was not as active as of late, though some of the less frequently noticed issues were dealt in, and the bulk of it was in the premier Company. The general tendency was very firm, and a good many quotations advanced; none receded. In Gaslight and Coke, the ordinary was fairly active and quite firm. Transactions ranged from 105½ to 106½ *cum div.*, and 103½ to 104¼ *ex div.*—a rise of ¼. In the secured issues, the maximum made 89¼ and 89⅜ *cum div.* and 87⅛ *ex div.*; the preference 104½ and 105½ *cum div.* and 103¼ *ex div.*; and the debenture from 82⅛ to 82¾. South Metropolitan was very quiet at from 121½ to 123 *cum div.* and 120¾ *ex div.*—a rise of ¾. The debenture made 81½—a rise of 1. In Commercials, there was only one deal—111 for the 4 per cent. Among the Suburban and Provincial group, Brentford old realized 255½ and 257 (a rise of 2), Ilford "A" 146⅛ and 146½ (a rise of 1), South Suburban 120¼ (a rise of 2), and Liverpool "B" 167 and 168. In the Continental companies, Imperial had only three transactions, at from 175 free to 176¼; ditto debenture made 94½; and European fully-paid 24⅜. Among the undertakings of the remoter world, Bombay old changed hands at from 5 15/16 to 6 1/16 (a rise of ⅛), Buenos Ayres at from 14 7/16 to 14 9/16, Monte Video at 12⅞ and 13, Primitiva at from 7⅛ to 7⅜, ditto preference at from 5⅜ to 5½, River Plate at 17¼ and 17⅜, and San Paulo debenture at 51.

ELECTRICITY SUPPLY MEMORANDA.

The Slow Pace in Power Supply—The Poor and the Rich Shareholder—"The Times" Controversy—A Trade Circular on Costs—More Fusing Reports—A Disregard of Dangers.

It is some time now since we have had anything to say about the use of electricity for power purposes. But references to the subject in the electrical press indicate that the pace of adoption is not fast enough, and there is great lamentation over the fact. In an editorial in the "Industrial Supplement" of the "Electrician," the writer excuses himself for being, on the one hand, satisfied at what has been done, and, on the other, for "a certain feeling of despair that sometimes comes over us at the magnitude of the task before us." "It may also account for the two mutually destructive qualities of optimism and pessimism which are at times apparent in one and the same article from our pen." This recalls a little criticism made in the "Memoranda" awhile ago. But that is not the burden of the editorial under review. It is that there must be combination for the common good in this matter of power supply, if something magnificent is really to accrue. We will only quote a couple more sentences from the article. It is remarked that, "though the progress that is being made towards universal adoption of electric power for general purposes is satisfactory, yet we are none the less impatient that more should be done in this direction." Naturally! Then "it has been stated that only 11 per cent. of the total power used in this country is electrical; so that if this percentage is to be increased at anything like a reasonable rate, more energetic measures must be taken to develop the power supply side of the business, and the general public must be persuaded, cajoled, and even forced to become electrified." If we properly appreciate what is meant by "power" in this connection, it is not the "general public" who may require it, but the industries; and to get them to adopt it, we should resort to persuasion only, and leave out the cajoling and the forcing. These are methods that have no good and lasting effect.

Turning aside from the editorial in question, and looking elsewhere at current news. The power business is the mainstay, or is intended to be, of the Yorkshire Electric Power Company. In 1908, the profit of the undertaking, which has been running several years, was, after paying debenture interest, only £718; while last year it was £2665. This sum is to be carried forward; and the

hopes of the ordinary shareholders are again deferred. But worse than this, another obstacle to placing them in a dividend-receiving capacity is due to the increasing business. The present capital expenditure cannot meet the additional business; and some fresh generating plant has to be put down. It is therefore proposed to raise the necessary capital by the issue of preference shares, and so, as the "Electrical Times" puts it, "there will be another charge to meet before the ordinary shares have a look in." By the irony of fate, or an unpardonable joke on the part of the printer, directly facing the editorial comment on the foregoing matter, there is an announcement that the National Gas-Engine Company are paying for the past year a 20 per cent. dividend, in addition to which they are placing £10,000 to reserve (making it £100,000), and are carrying forward £9943. The Company see scope for an extension of their business by building engines of considerably greater powers than those they at present produce. There is a demand for such engines; and so works are to be erected to turn out the mammoth types up to 3000-horse power. To meet the cost of doing this, an issue of 50,000 each of preference and ordinary shares is to be made. The pictures when contrasted are striking and instructive.

In the last two issues of the "JOURNAL," reference has been editorially made to the controversy that has been proceeding in "The Times," mainly between one of that paper's partizan contributors and Mr. Hanbury Thomas, of Sheffield. In another part of the present issue, there is reproduced a very singular piece of writing by the "Contributor," which no intelligent individual will accept as being, either in substance or argument, any adequate reply to Mr. Hanbury Thomas. The "Contributor," it is clear, is driven into a tight corner; and can only resort to platitude and evasion. The absurdity of his opening paragraph regarding cost is so pronounced that we will refrain from comment upon it. Many Sheffield consumers, who know more about the matter than "Contributor," will disageee with his deduction that they "could well afford to pay 5d. per unit, and still spend no more than they would on gas." "Contributor" considers, moreover, that it is obviously unfair to compare the cost of lamp renewals with mantle renewals when the latter are carried out under a maintenance scheme. He seems to suggest that under a maintenance scheme the mantles are "nursed." But the fact is the Gas Company only pay periodical visits under a maintenance system, so that the "nursing" is of a somewhat intermittent kind. "If a tungsten lamp is 'nursed,'" "Contributor" writes, "it will burn for 3000 hours (say, three years), and costs 2s. 9d. This is equivalent to the cost of mantle renewals at Sheffield for three years with mantles at 3½d." In general use, tungsten lamps are not "nursed," any more than are mantles, and they do not last anything like 3000 hours under ordinary conditions; so that we cannot see the force of the argument of "Contributor." He also tries to dispose of the question of ventilation and atmospheric contamination in a few sentences; but it is a subject that will not admit of such summary treatment. In all points raised in the controversy, the extensive and practical experience of the Sheffield Gas Company wins.

Curiously just as "Contributor's" poverty-stricken reply is under notice, we receive from a correspondent a copy of a circular by the Jandus Arc Lamp and Electric Company, Limited. They are the makers of a regenerative electric flame arc lamp, which, of course, the circular makes out, knocks all other systems of electric lighting completely out of the field in the matter of cost per 1000 candle-power-hours. We have not observed that anyone has gone into ecstasies over this light, though according to the circular, its cost for current and carbons—0·43d.—is about half that of any other flame arc lamp, basing calculations on the mean hemispherical candle power. But what we are more interested in than anything else in the table given in the circular are the figures as to electric metallic filament lamps and high-pressure gas lighting. Adopting the low and unusual (except for street lighting) price of 2d. per unit for the current used by the metallic filament lamps, it is calculated that the cost of current and lamp renewals would work out to 3·3d. per 1000-candle-hours. We are not going to compare high-pressure gas lighting with metallic filament lamps. The comparison would be unfair; but any way the figures for high-pressure gas lighting are open to our criticism. It is first observed that the Jandus Company kindly work out the cost per 1000 candle-hours for gas and renewals under the high-pressure system at 1·8d. And this is effected by the effrontery of assuming that the consumption of gas is 53 cubic feet of gas per 1000-candle-hours. Now what does this mean? That the efficiency of the high-pressure system of gas lighting is under 20 candles per cubic foot of gas consumed—an efficiency that can be readily obtained by inverted gas-lamps at ordinary pressures. It is a long span between the efficiency now derivable from high-pressure gas lighting and the day of the 30-candle-per-cubic-foot efficiency; and there never was a time when anybody but a lunatic would have thought it necessary, with the incandescent system, to raise the pressure of gas in order to obtain an efficiency of below 20 candles per cubic foot. However, taking the 53 cubic feet that Jandus thinks necessary per 1000 candle-hours, the cost of gas, at 2s. 6d. per 1000 cubic feet, works out at 1·59d., and to this is added 0·21d. for mantle and chimney renewals—making 1·80d. Supposing we bring calculation up to date, and take the high-pressure inverted gas-lamp, giving an efficiency of 60 candles per cubic foot of gas. Then we find that 17 cubic feet will suffice for the 1000 candle-hours; and 17 cubic feet at 2s. 6d. works out to 0·50d. This added to mantle and chimney renewals, representing (according to Jandus) 0·21d., makes 0·71d. per 1000 candle-hours. Therefore Jandus is 1·09d. out in the computation, through either not being up to date or deliberately misleading. We fear for the Company's honesty in this matter of high-pressure gas lighting; and the cause of our fear is the ascribed efficiency of something under 20 candles per cubic foot of gas.

Of course, it will be said the reports are erroneous, and that the newspaper reporters have been dreaming again. Hospitals containing sick and injured and buildings containing art collections are among the least desirable places for outbreaks of fire. A paragraph in one of the morning papers last Friday week stated that, owing to the fusing of an electric light wire, a fire occurred the previous day at the London Hospital; but, fortunately, it was discovered in time to restrict it to the store-room and basement. Then concern was occasioned in the West-end last Wednesday through an alarm of fire at Hertford House, where the priceless treasures of art bequeathed to the nation by Sir Richard Wallace are located. The discovery was made by a constable, who observed "a flickering" at a certain point. It was found that there had been a fusion or short-circuiting of electric wires in the boiler-house, and this had set alight some woodwork adjoining. But prompt action extinguished the fire before it could assume any considerable dimensions. Everybody will be glad the fires in both instances had not obtained such hold as to be beyond suppression in this way; but the incidents supply curious looking pendants to the legend "Electricity is the Safest Illuminant." That the authorities in whom reposes the protection of the Wallace Collection do not altogether believe in the legend, is attested by the fact that there is in existence an elaborate set of instructions for the attendants as to how to act in case of electric fusion. Sand is to be thrown upon the burning place if the current is still on; but a separate series of switch-room instructions indicates measures to be taken for switching off the current. It is directed that the switches that control the mains near the fire are to be turned off at once; and diagrams show each subdivision of the building, with, opposite, the number of the switch controlling that part of the installation. Instructions are also given as to the turning off of the main-switch, with the caution that this measure is to be resorted to only in the last extremity, as the act will place the entire building in darkness. Further, the location of the switches is given, so that, should the electrician or engineer not be upon the premises, action can be intelligently and decisively taken without delay. It is stated that the electric wires were only wood-cased at the part where the outbreak occurred; and anxious persons are already urging upon the Office of Works to complete the metal casing of the wires.

These instances show that, in what may surely be regarded as good installations, serious risks exist; but there are others that are produced by carelessness, ignorance, and the inconvenience of adopting safeguards. Electricity lends itself to this sort of thing. Nothing can be seen; the current is odourless. There is no flame, unless a self-generated one. Everything tempts to look upon the system as being absolutely safe, and precautions are not respected. Mr. W. R. Walton, Assoc.M.Inst.E.E., writes on this subject in the "Manchester Guardian." His experience shows that many risks are due to disregard of the most obvious dangers. He gives two examples. In a warehouse a fuse-board had been enclosed in the usual asbestos-lined box; but at the time of Mr. Walton's visit, the box had been removed, and loose inflammable goods were piled upon the floor to within a few inches of the unprotected fuses. A "short" on either of the circuits fused at that point, or on the board itself, would probably have caused another electrical fire in a building in which over 300 persons were employed. In a theatre a switch-board and a gas-meter were dangerously close neighbours, though an inexpensive fireproof partition could easily have been provided effectually to separate them. There are, of course, classes of risks in which the user is more or less helpless. He does not usually know whether the workmanship or material employed is what it should be.

Informal Meeting of Scottish Gas Managers.—We learn that this meeting, of which Mr. W. B. M'Lusky, of Perth, is the Convener, will be held at the Windsor Hotel, Glasgow, on Wednesday, the 6th of April, under the presidency of Mr. J. Ballantyne, of Hamilton.

Society of British Gas Industries.—As already notified in the "JOURNAL," the annual general meeting of the Society will be held at the Waldorf Hotel on the 24th inst. We learn from the Secretary (Mr. Arthur L. Griffith) that the proceedings will be opened at five o'clock, when the general business will be disposed of under the chairmanship of Mr. Thomas Newbigging, the retiring President. At the close of this, he will induct his successor, Mr. J. H. Balfour Browne, K.C., who at six o'clock will deliver his Presidential Address. Subsequently the members and guests will assemble at an informal dinner.

Dehydrating Liquids, Tar, Etc.—The Paris Gas Company have taken out a patent for apparatus for the above-named purpose. According to an abstract of the specification in the "Journal of the Society of Chemical Industry," the apparatus consists of an oil-bath containing a serpentine coil leading into an expansion chamber containing baffle-plates. The oil, tar, or other liquid to be treated is fed into the coil, where it becomes heated to a temperature above the boiling-point of water before being discharged on to the baffle-plates. The steam generated is carried away to a condenser by means of one pipe, while the dehydrated liquid flows away by another.

THE CASE FOR THE STANDARD BURNER BILL.

[COMMUNICATED—CONTINUED FROM PAGE 350.]

THE illuminating duty obtainable from gas varies with the burner used; and at the standard rate of consumption it is, or should be, higher with the standard testing burner than with any other burner which the consumer may use. Thus the duty obtainable even with the "London" argand burner No. 1 is higher than with any flat-flame burner. If the standard argand affords a duty of 16 candles per 5 cubic feet of gas consumed, the gas is said to have an illuminating power of 16 candles, and a flat-flame burner will give a light of $16-x$ candles per 5 cubic feet of gas consumed. If, on the other hand, the standard argand obtains a light of only 14 candles from the gas, the latter is said to have an illuminating power of 14 candles, and with that gas a flat-flame burner may be expected to give a light of $14-x$ candles. That is to say, x should have a constant value for all qualities of gas if the illuminating power of the gas ascertained by the standard argand bears a definite constant relation to the illuminating duty obtainable from flat-flame burners. The standard argand which affords as nearly as may be such a constant difference for a wide range of quality of the gas, obviously best indicates the relative values of gases of different illuminating power to the consumer who uses flat-flame burners. The value of x will depend on the particular type of flat-flame burner which the consumer elects to use; but, provided the type is not inherently bad, it should only be necessary to vary slightly the size of burner of a particular type according to the variations in the specific gravity and quality of the gas to ensure x being a constant for each type of flat-flame burner. If x is not practically a constant, there will be good ground for suspecting that the standard argand used in determining the illuminating power of the gas is not doing equal justice to all qualities of the gas employed.

How does the "London" argand No. 1 burner stand such a test of its fitness for use as a standard burner? If the illuminating power of gas is ascertained by consumption at the rate of 5 cubic feet per hour in the "London" argand No. 1, tests of the duty obtainable from various flat-flame burners show that when the illuminating power of the gas is reduced from 16 to 14 candles, that duty becomes reduced approximately as follows:—

No. 6 Bray's fishtail or union-jet burner	1·6	candles
„ 5 Sugg's table-top burner	1·5	„
„ 5 Peebles governor burner	1·6	„

If the difference between the illuminating power of the gas and its illuminating duty in each type of flat-flame burner were a constant, $= x$ candles, the reduction would in this case be 2 candles instead of the 1·5 and 1·6 candles shown by the tests. That is to say, if x candles is the difference between the illuminating power of the gas and the duty in a flat-flame burner when the illuminating power of the gas is 16 candles, the difference is only $(x - 0{\cdot}5)$ candles (or less by half a candle) when the illuminating power of the gas is 14 candles. The inference to be drawn from these figures is that the "London" argand No. 1 burner is, as compared with flat-flame burners, relatively unfair to the poorer qualities of gas. It exaggerates any reduction there is in the quality of the gas.

Dr. Ashby's contention, based on certain figures published by Mr. Dibdin, that "when gas of a lower illuminating power is burned in a flat-flame burner a greater quantity of it has to be used in order to obtain the illumination given by a richer gas than corresponds to the reduction of the lighting quality of the gas," has thus been shown to be untenable. If the illuminating power of the gas is ascertained, as in Mr. Dibdin's tests, by means of the "London" argand No. 1 burner, the converse proposition is in fact true—viz., that (to follow Dr. Ashby's phraseology) when gas of a lower illuminating power is burned in a flat-flame burner a *smaller* quantity of it has to be used in order to obtain the illumination given by a richer gas than corresponds to the reduction of the lighting quality of the gas.

The unfairness of the "London" argand No. 1 burner as a standard for assessing the relative values of different qualities of gas for flat-flame lighting having thus been demonstrated, it is now desirable to indicate how the "Metropolitan" argand burner No. 2 compares with it in this respect. As to the flat-flame burner, some progress in design has been made since the date of Mr. Dibdin's paper, and many gas companies have distributed gratis to their consumers large numbers of flat-flame burners of more efficient types than then existed. Perhaps the best of these burners is the Bray's "$\frac{G}{L}$ 5 Ft. $\frac{15}{16}$," which is now prescribed by the Metropolitan Gas Referees as the burner to be used in the flat-flame testings which are made for information in the official testing places in London under the provisions of section 5 (1) iii. of the London Gas Act, 1905. The burner thus prescribed must be "of the best available pattern," and it has been prescribed accordingly in the Metropolis for testing gas which has been required to have an illuminating power of 16 candles, as well as gas of 14-candle power; while it is common knowledge that in some districts of the Metropolis the gas supplied is wholly coal gas and in other districts a mixture of coal gas and carburetted water gas. This burner may, therefore, be regarded as behaving satisfactorily with gases varying considerably in candle power and in composition. It is cheap, durable, economical of gas, and eminently practicable for use by the consumer.

A series of very many comparisons of the results of testings of gas of varying qualities with the "Metropolitan" argand burner No. 2 and this flat-flame burner shows that there is virtually a constant difference between the results with the two burners, even though the quality of the gas is varied greatly. Thus, if x candles is the difference between the illuminating power of the gas and the light obtainable in the flat-flame burner at a fixed consumption of 5 cubic feet of gas per hour when the gas used is coal gas of an illuminating power of 17 candles, the difference will be $(x + 0{\cdot}08)$ candles when the gas used is coal gas of 15 candles illuminating power. That is to say, the results obtained with the flat-flame burner rise and fall almost absolutely coincidentally with the rise and fall of the illuminating power of the gas as ascertained by means of the "Metropolitan" argand burner No. 2.

The difference $(x + 0{\cdot}08)$ candles, or 0·08 candle over a range of two candles in the illuminating power of the gas, has been arrived at from the results of testings of neat coal gas. Since, however, Dr. Ashby has directed attention to the fact that a mixture of coal gas and water gas is supplied by a number of gas undertakings, it may be advisable to give the corresponding figure for a mixture of coal gas and carburetted water gas such as is supplied to many parts of London. If x candles is the difference between the illuminating power of the gas and the light obtainable in the flat-flame burner when the mixed gas used has an illuminating power of 16 candles, the difference will be $(x + 0{\cdot}18)$ candles when the gas used is mixed gas of an illuminating power of 14 candles. The increase of 0·18 candle in the difference between the illuminating power and the flat-flame lighting value, though greater than with neat coal gas, is practically negligible in comparison with the drop of two whole candles in the illuminating power of the gas. It may, therefore, be concluded that with both coal gas and mixed gas the results of testings of the illuminating power of gas with the "Metropolitan" argand burner No. 2 directly correspond with the variations which will ensue in the light obtainable from a flat-flame burner when the illuminating power of the gas is varied. Consequently, from the standpoint of the consumer who uses flat-flame burners, the "Metropolitan" argand burner No. 2 is the proper standard burner for testing the illuminating power of the gas with which he is supplied. Local authorities will best consult the consumers' interests by supporting the present Bill, which provides for the "Metropolitan" argand burner No. 2 being substituted for the "London" argand burner No. 1 and any other standard burners which do not give results corresponding with the lighting value of the gas in flat-flame burners.

The figures given above for the relation between the illuminating power of gas and its lighting value in flat-flame burners are derived from curves drawn on a diagram on which the results of many hundreds of comparisons have been plotted out. They are not, therefore, based on one or two testings only, but on the mean results of a large number. In regard to the pattern of flat-flame burner used, it may be observed that the same results are obtainable with other efficient patterns—*e.g.*, Bray's No. 4 union-jet regulator with No. 7 slit economizer cap gives practically identical figures. There are, however, only a few burners which can be used for both 16 and 14 candle power gas with equally good results, without alteration of the size of the burner; but provided the right size is used for each quality of gas, almost every well-known type of flat-flame burner will afford correspondingly good efficiency with both qualities of gas. That is to say any falling off in the light obtainable from a given quantity of gas with flat-flame burners will be no greater than the reduction in the illuminating power of the gas. Moreover, since the people who are now using flat-flame burners are almost all of the rapidly disappearing class of consumers who entirely disregard the lighting efficiency of the gas-burners they have, it may safely be predicted that any reduction made at any time in the illuminating power of the gas supplied may forthwith be more than balanced by changing the flat-flame burners in use for others of higher efficiency—which better burners every gas company nowadays is prepared to supply and fit at a nominal cost, often even gratis.

It has thus been shown that, even if the introduction of the "Metropolitan" argand burner No. 2, in place of a more antiquated standard burner at present prescribed for testing the illuminating power of the gas supplied in a district, may admit of the illuminating power of the gas being reduced to a slight extent below that to which the consumers have been accustomed, yet even those consumers who continue to use flat-flame burners will suffer no real injury thereby. It has not, moreover, been alleged by Dr. Ashby, or by any spokesman or section of the bodies that are contemplating opposition to the Bill, that, if incidentally its provisions admit of a small reduction in the illuminating power of the gas supply, the consumers who use incandescent burners will suffer the smallest injury thereby. Hence it may be fairly accepted as an established fact that in granting to the promoting companies the measure of justice for which they ask—viz., the right to have the illuminating power of the gas they supply tested by the burner which is most suitable for obtaining from the gas the greatest amount of light—Parliament will not be inflicting the smallest injury on any consumer of gas for lighting purposes.

No injustice or injury will be done to the user of either incandescent or flat-flame burners by this somewhat belated act of justice to the gas companies.

The first three grounds of opposition to the Bill, which are indeed the only ones really relevant to its provisions, have now been dealt with at length; and it only remains to discuss briefly the remaining five points which one or two of the opponents of the measure apparently desire to raise merely because the fact that the promoting companies are coming to Parliament affords them the semblance of an excuse.

The fourth point, which is the first and most important of the five irrelevant issues raised by opponents of the Bill, is to the effect that, having regard to the general use of incandescent burners for lighting and to the extended employment of gas for heating and power purposes, for all of which uses the illuminating power of the gas is of no moment, whereas its calorific power is of importance, a standard calorific power of the gas should be fixed, and provisions for the making of testings of calorific power should be included in the Bill.

It is necessary to recall to mind the fact that the present Bill does not provide for any reduction in the prescribed illuminating power of the gas supplied by any of the promoting companies, and therefore it does not raise the question of the quality of that gas, which, moreover, varies very considerably in different towns according to local practice and requirements. The Bill merely provides for the general adoption of a uniform and equitable method of ascertaining the illuminating power of the gas, which method embodies the fundamental principle underlying the testing provisions of the precedential Acts of 1868 and 1905, and affords, as has been demonstrated, the best criterion of the relative value of the different qualities of gas to the consumer. This method, involving, as it does, the adoption of the "Metropolitan" argand burner No. 2 as the standard testing-burner, has in fact, since the passing of the London Gas Act, 1905, been prescribed by Parliament in the Acts or Provisional Orders of over seventy gas undertakings.

In no case has Parliament imposed any condition as to the calorific power of the gas supplied when authorizing, either directly or indirectly, the use of this burner for statutory testings of illuminating power. The only gas undertaking in the United Kingdom which is required by Act of Parliament to supply gas conforming to a prescribed standard of calorific power, is the Gaslight and Coke Company. The statutory testings of the illuminating power of the gas supplied by this Company were carried out with the "Metropolitan" argand burner No. 2 for four whole years prior to the prescription of a standard of calorific power. The legislative act which called for the employment of this standard testing burner in the case of this Company had not the slightest relation to, or connection with, the subsequent legislative act which imposed a standard of calorific power. There is absolutely no precedent for raising the question of the imposition of such a standard in connection with provisions for the legalization of the use of the "Metropolitan" argand burner No. 2; and it is highly improbable that a Parliamentary Committee will so far disregard precedent as to concur in the question being raised on the present Bill. One gas company only in the whole country have so far, in return for definite concessions in no way connected with the method by which the illuminating power of their gas is tested, accepted the imposition by Parliament of a standard of calorific power. The local authorities concerned in the present Bill cannot hope that the promoting companies will accept a standard of calorific power except in return for similar concessions, for none of which are they now asking Parliament.

The history of gas legislation in the United Kingdom indicates that the Metropolitan gas undertakings have always been subject to more onerous standards of quality and methods of testing than provincial undertakings; yet so far a standard of calorific power has been applied to only one of the Metropolitan Gas Companies, and this took place four years after, and quite independently of, the imposition of the "Metropolitan" argand burner No. 2 for testing the illuminating power of the gas. The local authorities who contemplate opposition to the present Bill should bear in mind that no concession was required of the Metropolitan Gas Companies in return for the legislative authority to have their gas tested by means of the "Metropolitan" argand burner No. 2. It is inconceivable to those familiar with parliamentary practice in gas legislation that Parliament will expect or require provincial gas companies to make concessions in regard to quality or testing which the Metropolitan Companies have not made. There can be no question of a *quid pro quo* in respect of the provisions of the present Bill, since none has been taken of the many and more important gas undertakings which have already secured these provisions in their respective Acts and Orders.

When any of the companies promoting the Bill come to Parliament for a reduction of the prescribed illuminating power of the gas they supply, it will be time enough for the local authority concerned to ask for the imposition of a standard of calorific power. But even then Parliament will probably be satisfied that a provincial gas company is entitled to the same consideration as the Metropolitan Companies—viz., that there shall be a period of four years or more during which the authority shall be empowered to make testings of the calorific power of the gas supplied with a view to securing information thereon, and that no standard of calorific power shall be fixed until after such a period has elapsed. It is reasonable that provincial gas undertakings should be allowed at least as long a probationary period of testings for calorific power as the Metropolitan Gas Companies, in order that they too may learn to what average value they work, and the extent of the fluctuations therefrom with the methods of manufacture and the raw material which they use. No advantage would accrue to any consumer if, through inadvertence or ignorance, a standard of calorific power were fixed for any company, to comply with which would entail scrapping a large part of its manufacturing plant, revolutionizing its methods of working, and seeking coal for carbonization from fresh sources of supply at enhanced prices. Yet at the present time there is scarcely a gas undertaking outside the Metropolis which is in a position to work to a standard of calorific power without serious risk of being forced thereby to one or all of these measures. The consumer would suffer severely from the consequent increase in the price of gas. A local authority which has at heart the interests of gas consumers should proceed cautiously in asking for a standard of calorific power of the gas supplied. Until a gas undertaking obtains parliamentary sanction for a reduction in the prescribed illuminating power, there can be no appreciable reduction in the calorific power of the gas supplied. It will be time enough when such sanction is sought to attempt to secure authority for the making of calorimetric testings for information, with a view, after a sufficient lapse of time, to the prescription of a standard of calorific power.

The author may remark here, for the information of those who may, through lack of proper advice, be fearful that a fall of illuminating power will necessarily involve diminution of the calorific power of the gas, that the results of a very large number of testings show that the net calorific power of 18-candle power coal gas is not merely no higher than that of 15-candle power coal gas, but actually about one unit per cubic foot lower. With mixed coal gas and carburetted water gas, a fall of one candle in illuminating power may be attended by a loss of as much as 3 calories in calorific power; but this loss is for most heating purposes more than counterbalanced by the higher flame temperature of the mixed gas as compared with neat coal gas. If Dr. Ashby had included in his report to the Reading Town Council on the Bill [see "JOURNAL," Vol. CVIII., p. 688] further particulars of Mr. Dibdin's researches in 1900, he could have added that Mr. Dibdin arrived at the conclusion that a mixture of one volume of coal gas with three volumes of carburetted water gas was more efficient by 7 per cent. for incandescent lighting than neat coal gas. Since incandescent lighting is only one branch of heating by gas, it may be concluded generally that additions of carburetted water gas, such as are made to coal gas in many gas-works, have really no deteriorating influence on the practical heating value of the gas, even though the theoretical calorific power may be slightly reduced. It will, however, be time enough to discuss these matters in detail when a Bill is before Parliament which provides for a reduction in the prescribed illuminating power of the gas supplied, or for the imposition of testings of calorific power. It is premature to consider them in connection with the present Bill, which is concerned with neither of these things.

The fifth point raised by one or other section of the forces opposing the Bill—viz., that as the consumption of gas does not now to such an extent as formerly take place in the evening hours, the testing of gas for quality should be permitted at other times instead of, as at present, only in the evening—is really subsidiary to the attempt to secure the prescription of a standard calorific power for the gas supplied, since the daytime consumption of gas is mainly for heating purposes. There can be no object in extending the time during which testings for illuminating power may be made, seeing that the consumption of gas in burners with which its illuminating power is of importance is rapidly diminishing and will soon become almost *nil*. The point may be raised when a Bill providing for testings of calorific power comes before Parliament. It is premature to discuss it now.

The sixth point raised is that a limitation should be imposed as to the pressure at which gas may be supplied. It is not clear whether this proposal (which emanates from Cambridge) is that there should be a *minimum* or a *maximum* limit to the pressure at which gas may be supplied. A minimum limit is imposed on the Metropolitan Gas Companies; but it is in practice never approached, and testings of pressure are falling into abeyance in the Metropolis. The imposition of a maximum limit would be so highly detrimental to all users of gas for heating purposes, including lighting by incandescence, that it cannot be regarded as a serious proposition.

The seventh point—viz., that sulphur restriction clauses should be re-enacted—has absolutely no relation to the object of the present Bill. It means that Parliament should now be asked to reverse all the legislation of the present century in regard to the purity of public gas supplies. Such an issue can only be raised in a Bill promoted primarily, if not solely, for this object.

The eighth point—viz., that the testing apparatus and method of testing should be those prescribed from time to time in the Notification of the Metropolitan Gas Referees—must have been raised in ignorance of the immense difference in the conditions of testing of gas in London and in most provincial towns. The prescriptions of the Gas Referees are made in view of the fact that a large number of testing-places are maintained in London, and daily testings are made in each by a permanent staff of gas examiners, many of whom are almost wholly occupied thereby. How many of the local authorities concerned in the present Bill are prepared to incur the expense of daily testings? Such an expense can only be justified where the consumption of gas is on a relatively enormous scale. Many of the prescriptions of the Gas Referees are

wholly inapplicable to testings made at intervals of a week or thereabouts. The provisions of the London Gas Act, 1905, to the effect that the burner prescribed for testing the illuminating power shall be the most suitable for obtaining from the gas the greatest amount of light, and that the Gas Referees shall prescribe the standard burner accordingly, are in fact covered by the power which the present Bill reserves to the Board of Trade to approve the use of another standard burner in place of the "Metropolitan" argand burner No. 2. There is no doubt that if the Gas Referees (who are appointed by the Board of Trade) subsequently prescribed another standard burner instead of the latter, the Board of Trade would, if approached, approve its use also by any of the promoting companies, under the power which the Bill proposes to confer on it. No other change which the Gas Referees may find it their duty—whether in consequence of fresh legislation for the Metropolitan Gas Companies or otherwise—to make from time to time in their prescriptions can fairly be made forthwith applicable to provincial gas undertakings, which are not protected by the provisions embodied in the numerous Gas Acts which apply to the Metropolis and to the Metropolis alone. Metropolitan gas legislation and gas testing stand apart from provincial gas legislation and testing. The special testing provisions of the Metropolis cannot be detached from its special gas legislation.

The grounds of opposition to the Bill, so far as they have been disclosed, have now been pretty fully reviewed and disposed of; but other points may arise, and it may be useful to summarize the points made in favour of the Bill being allowed to pass unopposed. The author, therefore, proposes, with the Editor's permission, to revert to the subject in a brief article in a subsequent issue of the "JOURNAL."

SCOTCH GAS PROVISIONAL ORDERS.

THERE are five Scotch Provisional Orders to be dealt with; and this will complete the review of the projected gas legislation for the first session of the new Parliament.

The Dunblane Gas Company, Limited, are asking for additional capital—proposing that it shall not exceed £16,000, consisting of £6000 ordinary share capital ("A") already raised, and further ordinary share capital ("B") of £3000, to be issued to the holders of the "A" shares according to their respective holdings, and £7000 of additional capital. The maximum dividends are placed at 10 per cent. on the "A" capital, 7 per cent. on the additional capital, and 5 per cent. on the "B" capital. Borrowing powers are sought equal to one-third of the issued capital, including the "B" capital. Land and works powers are followed by a number of clauses of the ordinary type, including that referring to prepayment meter supply. The standard contemplated for the illuminating power of the gas is 14 candles, tested by the "Metropolitan" No. 2 burner. As to a standard price, the suggestion is 5s., with the sliding-scale working on ordinary lines. Provision is made for special purposes and reserve funds. [*Parliamentary Agent: Mr. John Kennedy.*]

The Falkirk Corporation are seeking further borrowing powers for their gas undertaking, to an amount not exceeding £55,000. The Corporation also desire to reduce the illuminating power of the gas supplied by them, and propose a standard on the customary lines of 14 candles, tested by the "Metropolitan" No. 2 burner. "Unless daily tests are made by the gas examiner, the method of reporting periodical tests shall be such as to carry forward the average of the previous tests in the following manner—viz., the test made on any one occasion shall be added to the tests made on the two previous occasions, and the average of the three shall be reported as being the illuminating power so ascertained." Sanction is sought for the making of differential charges as between gas used for private lighting and gas used for other purposes. Accompanying is the 10 and 15 per cent. discounts clause. [*Parliamentary Agents: Messrs. A. & W. Beveridge.*]

There is a very substantial draft Provisional Order, lodged by the Glasgow Corporation with the view of consolidating and amending their Gas Acts from 1869 to 1909, and to assemble all the provisions worth retaining (with additions) in the one Order. We need not review the draft Order with any completeness, having regard to the fact that in many respects the clauses are merely reintroductions or of ordinary character. In connection with the manufacturing powers, the Corporation ask to be allowed to produce, store, and supply non-illuminating gas, to which gas the sections referring to price, discounts, pressure, and quality are not to apply. A proviso to the enabling power prohibits the Corporation from laying down mains and pipes for the supply of non-illuminating gas, within any burgh outside the city, except with the consent of the Council of such burgh. Authorization is sought for the supply of fittings and apparatus required for the use of such gas. Several clauses allude to road crossings for railways. Additional land powers are sought, to the extent of 30 acres, with purchase by agreement only. The maximum price of gas is entered at 4s. 7d.; and sanction is asked to the charging of differential rates as between gas used for private lighting and gas consumed for other purposes. Within the supplementary supply district, authorization is desired for the charging of rates higher than those charged in the city supply district, with power to vary the higher rates in different parts of the supplementary supply district, but not to exceed the maximum price. It is proposed to take power to allow discounts in consideration of prompt payment, not exceeding in any case 5 per cent. The standard illuminating power of gas, it is intended to reduce to 14 candles, tested by the "Metropolitan" argand burner No. 2. In pursuance of their several Gas Acts, the Corporation have been authorized to borrow various sums of money amounting in the whole to £3,972,268, of which £3,072,268 is applicable to the gas undertaking. Therefore it is proposed that it shall be enacted that the borrowing of the £3,072,268 "shall be deemed to have been authorized by, and for the purposes of, this Order." The remaining money clauses of the Order have no general interest. The schedules to the Order are extensive—dealing with railways and bridges, defining the gas-supply district and the lands on which the Corporation may manufacture and store gas and residual products, and treating of several other matters. [*Parliamentary Agents: Messrs. Martin and Co.*]

A draft Order by the Kirkcaldy Corporation contemplates an extension of the municipal and police boundaries, the construction of electric tramways, an extension of the area of electricity supply, and the granting of certain powers relating to the gas-works. Land is scheduled for works purposes, and powers are inserted for its utilization. The Corporation are seeking to set themselves outside section 41 of the Burghs Gas Supply (Scotland) Act, 1876, in regard to surplus gas revenue, by proposing that it be enacted: "(1) If and whenever, after providing for the depreciation and renewal fund and other charges mentioned in the said section, there shall be remaining any surplus on account of the revenue of the gas undertaking, the Corporation may carry such surplus, or part thereof, as they see fit, to the Burgh General Assessment. (2) The Corporation may fix the charge for gas consumed for public purposes at such price as they see fit." Consistent with other promoters, a standard illuminating power of 14 candles is desired to be prescribed, with the "Metropolitan" argand No. 2 as the test-burner. The fittings clause makes it imperative upon the Corporation to adjust their charges therefor so as to recoup expenditure. Regarding the gas loans, it is proposed to extend the period of repayment by substituting "one-fiftieth" for "one-fortieth," in the application to the undertaking of the Burghs Gas Supply (Scotland) Act, 1876. Again, in the application of section 48 (sinking fund) of the Burgh Police (Scotland) Act, 1903, to moneys borrowed by the Corporation under the Burghs Gas Supply (Scotland) Act, the section shall be read as if for the words "not exceeding thirty years from the date of borrowing," there were substituted "in the case of moneys borrowed to pay the purchase price of the gas-works not exceeding fifty years from the second year after the Corporation commences to supply gas, and in the case of borrowings to meet the cost of any extensions or improvements not exceeding fifty years from the date of borrowing." [*Town Clerk: Mr. Wm. L. Macindoe.*]

In an Order promoted by the Wishaw Corporation, an extension of the burgh boundaries is proposed; and for the annexed areas, authorization is desired to the supply of gas. [*Parliamentary Agents: Messrs. A. & W. Beveridge.*]

Using an Exhauster for Boosting Town's Mains.

In small gas-works the introduction of automatic lighting and extinguishing apparatus by pressure has in the past been looked upon as unworkable, because of the inability to create the extra pressure wave in the mains. This has now been got over in an ingenious manner in the public lighting of the Kennoway (Fife) district. Mr. J. J. Scott, the Manager of the local Gas Company, was called upon by the local authorities to erect 66 street lamps; and Alder and Mackay's apparatus was specified to light and extinguish them. The excess pressure at his command was only 5-10ths; and this was found to be too little. To get out of the difficulty, he arranged to bring the exhauster into use as a booster; and a connection was taken from the outlet of the exhauster to the town main, and another from the holder to the inlet of the exhauster. Between these two pipes is placed a 3-inch excess bye-pass governor; and this, with a catch purifier on the pipe leading to the town main, completes the arrangement. To operate it, the man in charge simply opens a valve leading to the town main, and closes the one between the exhauster and the washer—thus forcing the make of gas direct to the town. If the make of gas at the time is not sufficient to feed the exhauster, the valve on the pipe leading from the holder is opened a little, to keep up the supply of gas. A few revolutions of the exhauster is sufficient to raise the pressure in the mains to 5 or 6 inches, or more if necessary; but the excess bye-pass governor can always be loaded just to give the desired pressure. Suppose 5 inches is required, the governor is loaded accordingly; and though the exhauster may pass more gas than is necessary, it simply returns through the bye-pass governor, and thereby a steady 5-inch pressure is maintained on the mains. The arrangement has been in operation for three months, and is a thorough success, and much more satisfactory than loading the holder, as has in some cases been done.

At the monthly meeting of the Richmond Town Council last Tuesday, the Water Committee expressed regret at the sudden death, on the 19th ult., of Mr. Joseph Quick, their Consulting Engineer in the matter of the Petersham filter-beds, and stated that they had formally appointed Mr. W. G. Peirce, the Corporation Water Engineer, as Engineer for the completion of the work.

THE GAS-HEATING RESEARCH COMMITTEE AND ITS WORK.

We are asked by the Gas-Heating Research Committee of the Leeds University to publish the following correspondence.

The University, Leeds, Feb. 10, 1910.

Sir,—The publication of the report of the Committee on Gas-Heating Research has led to a considerable amount of inquiry and correspondence from various gentlemen interested, in one way or another, in the investigation. At the last meeting of the Research Committee, it was decided that I should write a letter to the Technical Press, explaining the attitude which the Committee desire to take up in regard to this matter.

In the first place, the Committee think that the results of the experiments made under their guidance should not be communicated to anyone before they are published by the Council of the Institution.

In the second place, the Committee desire to respond as far as possible to any inquiries which may be made with regard to the work already published. To this end, Mr. E. W. Smith (the Research Chemist) will be authorized to answer letters and to receive visits. The Committee are also of opinion that Mr. Smith may accept invitations to visit works, since they regard it as of great importance that he should be as conversant as possible with the views and experience of practical men. The amount of time devoted to these purposes will, of course, be limited, as the experimental work makes continuous demand upon Mr. Smith's time and energies.

May I say, as an official of the University, that we have always welcomed visitors to our buildings, and have shown them freely everything likely to interest them.

Arthur Smithells,
Chairman of the Gas-Heating Research Committee.

Sir,—The Gas-Heating Research Committee have of late received numerous inquiries from instrument makers and gas-stove manufacturers for fuller details of the Committee's method of measuring radiant heat.

As a slight modification in the mechanical arrangement of the method has been made since the report was published, the Committee think it desirable that the improvement which ensures greater accuracy of manipulation and a considerable saving of time, should be communicated to the Technical Journals.

It will be remembered that the method was divided into two parts: (i) That in which the radiometer was used for determining the number of calories of radiant heat falling on the face of the radiometer at a point 34·4 inches from the front of the stove. (ii) The second part consisted in taking thermopile readings over the surface of the hemisphere of 34·4 inches radius, having its centre at the centre of the surface of the fuel.

These readings were taken at certain points, as described in the Gas-Heating Research Committee's report in the Institution's Journal, 1909.

The modification does not in any way alter the method as outlined above, but relates to the means by which the thermopile may be brought to the desired points. This can be seen from figs. 1 and 2.

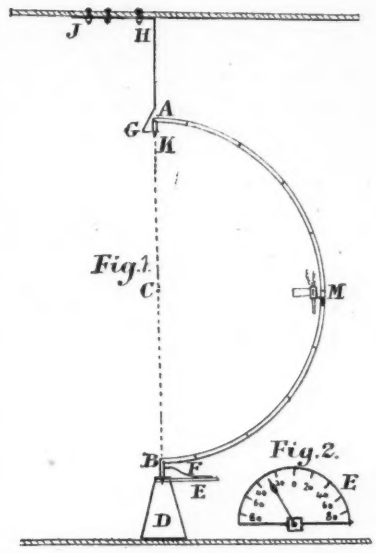


Fig. 1.

Fig. 2.

A piece of ¾-inch round, mild steel is bent in the form of a semicircle, of 36 inches radius, with two bent ends K and B, turned to ½ inch, as rests at G and D (fig. 1).

This semicircular iron bar revolves round the axis K B. If the centre of the surface of the fuel of the stove is at C, then the centre thermopile reading is at M; the centre of the thermopile being 34·4 inches from C.

The radius of the iron semicircle being 36 inches, the half circumference is 113¼ in. This, divided by nine, will make each division 12¼ inches.

These should be marked off above and below the centre point M, and will be at 20°, 40°, 60°, and 80° above and below the line C M (fig. 1.)

The angles at which the readings should be taken to the right and left of the stove may be obtained by the indicator E. This rests rigid on the base D (fig. 1), and a pointer F—seen in section in fig. 1 and in plan in fig. 2—attached to the revolving semicircle at B (fig. 1), marks off the angle required on E (fig. 2.)

The fittings J H G (fig. 1) are made of 2-inch by ¼-inch mild steel, as is also the plate surmounting the base box D.

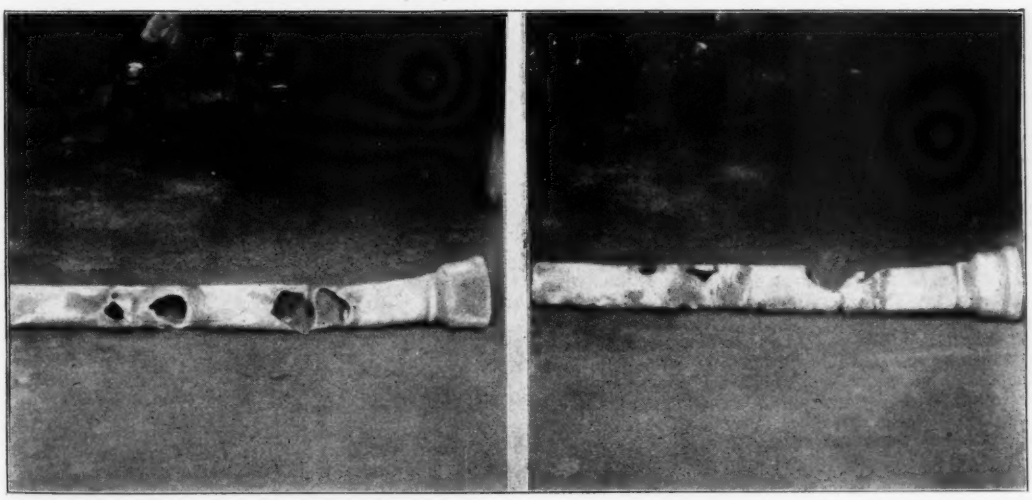
Anyone adopting this apparatus would make these according to the special condition of his room.

E. W. Smith,
Research Chemist to the Gas-Heating Research Committee.

DANGEROUS VAGRANT ELECTRIC CURRENTS.

Fusion of a 4-inch Gas-Main.

The accompanying photographs show side and top views of a 4-inch cast-iron main pipe which was removed from the north side of Harrison Road, Calcutta. According to a communication received by the Secretary of the Oriental Gas Company (Mr. H. J. Luff) from the Manager in Calcutta (Mr. J. C. Watson), the Company on Jan. 3 received notice that there was a large escape of gas that afterwards became ignited, causing contiguous shops to



be—to describe the position mildly—in imminent risk of damage. On opening the ground, it was found that a feeder electric cable belonging to the Calcutta Tramways Company had fused three large holes in the main, one of which had left practically nothing but the lower part of the pipe, which became fractured. The gaping wound can be seen in the right-hand side photograph, for taking which the two pieces of pipe were laid close together on the ground.

DESSAU VERTICAL RETORT-SETTINGS.

New Model for 1910.

We have received particulars of the new pattern of vertical retort-setting which the Dessau Vertical Retort Company are introducing this year. It is substantially the same as the pattern of Dessau setting with eighteen retorts which has been in use at the Mariendorf works in Berlin of the Imperial Continental Gas Association for a considerable time, and on the working of which a report has already been given in the "Journal." This report formed an appendix to a paper by Mr. E. Körting, of Berlin, on "Modern Methods of Carbonization," and related to an efficiency trial, extending over 105 hours, which was carried out on the setting by the Instructional and Experimental Gas-Works of the German Association of Gas and Water Engineers (see *ante*, pp. 27 and 96).

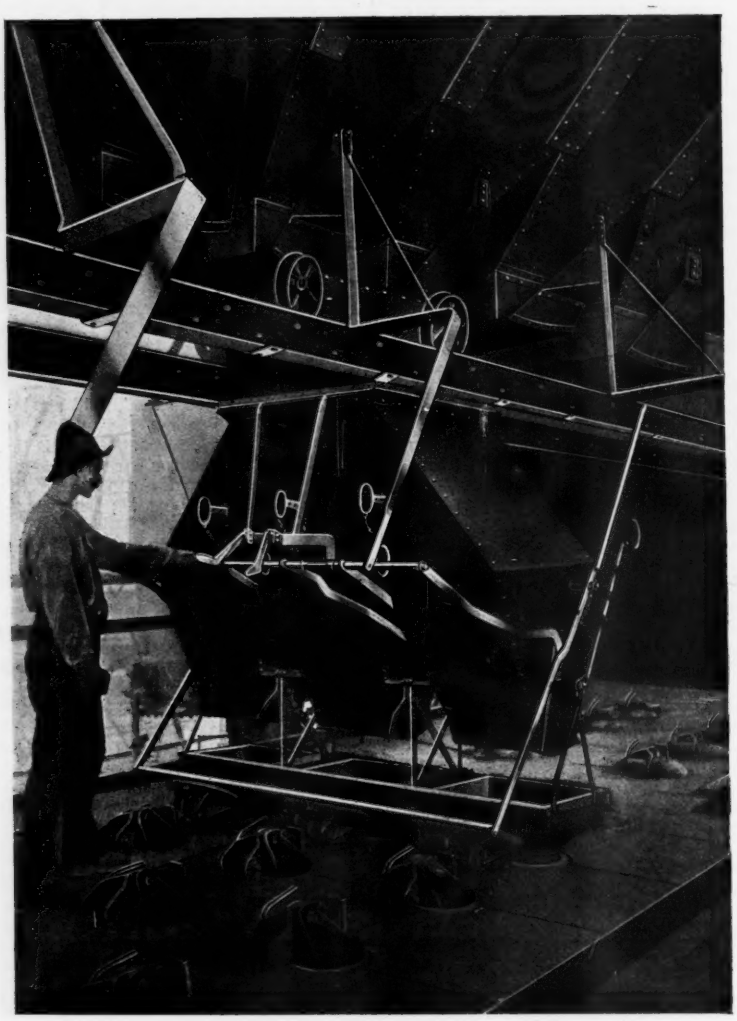


Fig. 1.—The Coal-Charging Waggon over the Upper Retort Mouthpieces.

The new pattern of setting embodies several important changes in addition to the increase in the number of retorts. There are eighteen retorts arranged in three rows in each setting, instead of twelve retorts in two rows in the old type of Dessau setting. The three retorts in a line from back to front of the setting are, however, worked together so far as charging and discharging are concerned, as if they were one unit. The charging of the three retorts is effected simultaneously by the special charging waggon which is shown in position above the upper mouthpieces of the retorts in fig. 1. The discharging of the three retorts is effected simultaneously by the lower retort doors being mounted on the same shaft, the turning of which opens and closes the three doors at one operation. The shaft is turned by hydraulic power from a central position, so that the work of discharging the retorts consists only in opening and closing a cock. The arrangement is shown in action in fig. 2. The upper mouthpieces of the retorts are connected directly with one another and to a common gas-exit pipe which slopes down to the retorts. This arrangement presents the advantage that any thick tar or pitch depositing in the pipes, runs back into the retorts and is there gasified. The horizontal pipes and pitch pans need to be cleansed only once in from eight to fourteen days. The coke discharged from the series of three retorts coupled together is received and removed by a trough conveyor, as in the case of separate retorts. The producer and the regenerator are similar to those of the earlier pattern of Dessau setting. The producer has a step-grate, so that with ordinary coal it is quite unnecessary to introduce temporary or intermediate grate-bars for clinkering. It is anticipated that the new setting will have a longer life than the earlier pattern. At Mariendorf, it has already had five months continuous working, and has given entire satisfaction. There are at work or under construction 33 of the new pattern setting—equal to a total productive capacity of about 8,650,000 cubic feet of gas per diem.

Some figures are given of the performance of the new pattern setting—mainly based on the results of the trial at Mariendorf conducted by the Instructional and Experimental Works of the German Association. A few of the round figures now supplied may, however, be quoted by way of supplementing the results that have already been given from that report in the pages of the "Journal" (see *ante*, p. 27).

The make of gas per setting per diem amounts to about 261,200 cubic feet, and the make per ton of coal carbonized to 13,430 cubic feet. The calorific power of the gas is about 543 B.Th.U. per cubic foot. The fuel consumption in the retort-furnaces amounts to 11·8 per cent. of the weight of the coal carbonized, or to 20 lbs. of coke per 1000 cubic feet of gas made. Since three retorts are coupled together, the weight of coal per charge per unit amounts to nearly 1¼ tons, which means that there is an economy of labour as compared with the former setting in the ratio of 2 : 5. For the most unfavourable case—namely, when English coal is carbonized and twelve hours are required for working-off the charge, steam being admitted—there are required six men per 24 hours to attend to ten settings, giving an output of about 2,330,000 cubic feet of gas per diem. The men work in two shifts of eight hours, two being required to attend to the retorts and one for clinkering the producers. The labour required, therefore, is one man for about

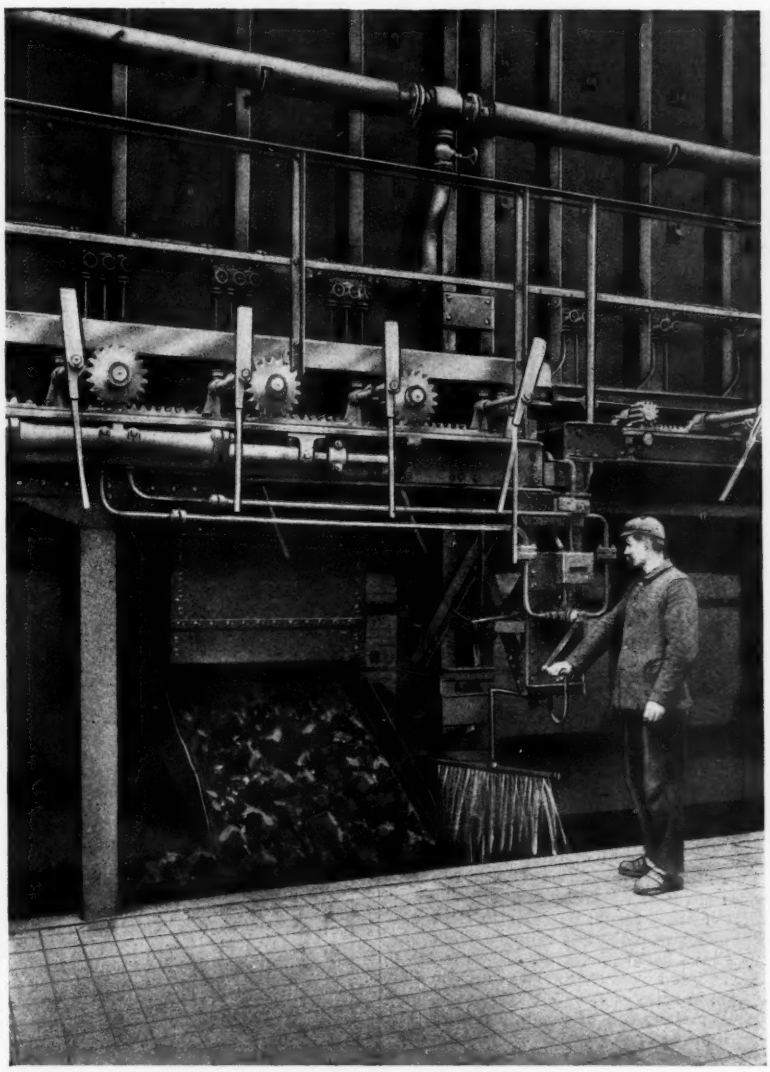


Fig. 2.—The Discharge of Coke from the Retorts into the Trough Conveyor.

388,300 cubic feet of gas made per diem; so that the wages per 1000 cubic feet of gas made amount to only 0·18d. The make of gas per square foot of ground covered by the setting amounts to 865 cubic feet, or from 30 to 48 per cent. more than formerly. It is claimed that the reduced expenditure on the retort-house will, therefore, amount to about 30 per cent., while for each setting only six dip-pipes and take-off pipes are required, and the hydraulic main is shorter relatively to the make of gas. The mechanical equipment is simpler, and the coke and coal conveyors are likewise simplified and so rendered less costly.

MANUFACTURE OF INCANDESCENT MANTLES.

Latterly there has been a tendency in Germany to publish special treatises, each dealing with a particular branch of industry. The recently-published book on the manufacture of the incandescent gas-mantle by the well-known gas-lighting expert Dr. C. Richard Böhm,* deals with this special branch most exhaustively—consisting as it does of some 450 pages (8vo.), with 431 illustrations and 37 plates. To the layman, and even to many practical workers, it would seem at first sight that the subject would hardly require to be dealt with in a book of such size. When, however, the vast number of manipulations—most of which are now-a-days carried out by special machines—the various sources of the raw material, and the treatment of it at different stages of manufacture, are considered, it will be realized that a comprehensive text-book on the subject meets a long-felt want. Even the magnesia industry, which furnishes the rings for the inverted mantles, and the particular methods adopted for packing the latter for shipment, have not been overlooked. Furthermore, the author has devoted particular attention to the patent literature on the subject, with a view to tracing the gradual development of invention in this important branch of chemical industry.

Dr. Böhm's new book is a sequel to his previous work "Gasglühlicht," published in 1905. In the introductory chapters, the development and present position of the gas-mantle industry are described in detail. The more important raw materials—such as monazite sand, thorium, and cerium nitrate, and the yarn materials—are fully dealt with. The main part of the work is devoted to the manifold operations conducted in the factory, comprising the knitting, washing, impregnating, and sewing of the mantles, the fastening of the asbestos hook, the magnesia ring, stamping, burning-off, sorting, and packing. These and many other subsidiary operations are completely described. A very interesting chapter on photometry concludes the work.

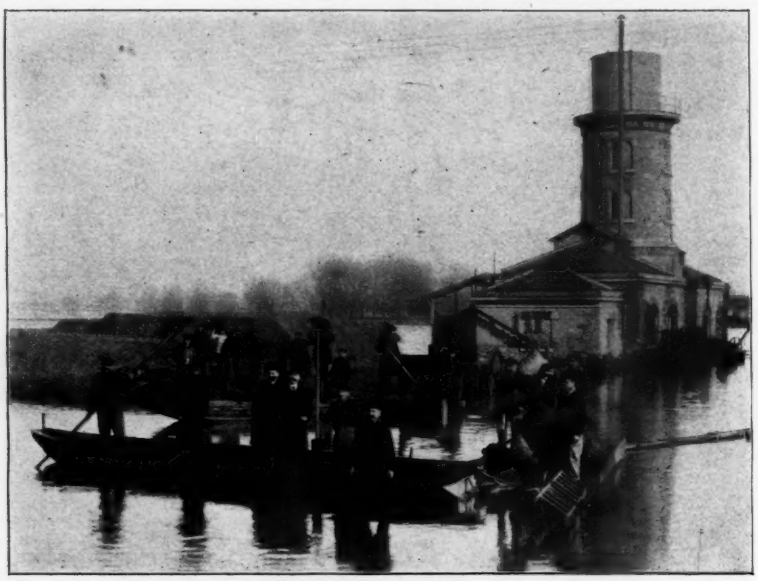
We can strongly recommend the book to those of our readers who are at all familiar with the German language; for the author's reputation in this branch makes it a standard work for gas-lighting engineers.

* "Die Fabrikation der Glühkorper für Gasglühlicht." By Dr. C. Richard Böhm. Published by Wilh. Knapp, of Halle A/S.; 1910. Paper cover, price 22 marks; in cloth, 23 marks.

Producer Gas Power Plants in the United States.—The United States Geological Survey have lately published some statistics of producer gas power plants in the United States. The first producer gas plants were erected about ten years ago; and at the present time there are upwards of 500 in operation, with an aggregate of about 115,000 H.P. Tests made with the Government plants at St. Louis (Mo.) and Norfolk (Va.) have shown a fuel consumption under the most favourable conditions as low as 0·95 lb. per electrical horse power at the switchboard. Tests with 75 grades of bituminous coal show a ratio of coal per brake horse power fired under a boiler to coal per brake horse power burned in a producer of 2·7. Many low-grade coals and lignites which cannot be burnt successfully under a boiler, are stated to give excellent results in a gas-producer.

A GAS-WORKS UNDER THE WATERS OF THE SEINE.

The Nanterre Works of the Union des Gaz.



Making a Works Inspection, and Labour Carried on, under Difficulties.

THE disaster by flooding which has befallen Paris and numerous communes along the banks of the Seine has, through the horrors of the situation—the suffering, the deprivation, and the incalculable losses occasioned—evoked general sympathy; but there has been none too much recognition of the labours of those who were in any way called upon, through official position in connection with the public services of the city and the towns involved in the great inundation, to put forth unusual energies in unprecedented circumstances. We cannot make any proper conception of the herculean tasks they have had to perform. Not the least of the beneficent services rendered were by the gas-works in the affected areas that were able, in spite of the unrestrained waters of the Seine, to cause some amelioration of the miseries of the situation by maintaining a supply of gas.

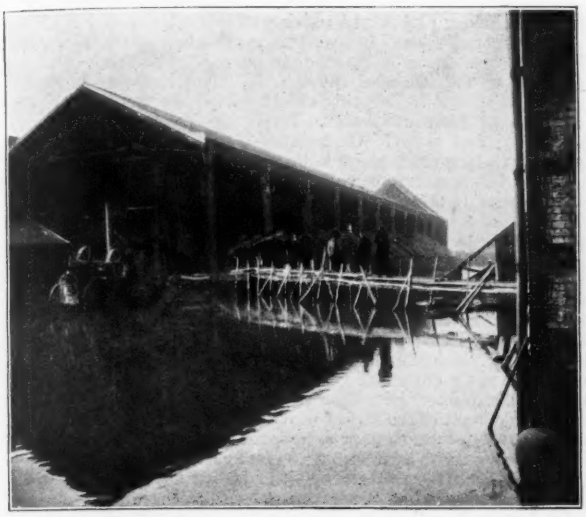
Contemplating Nature's Invading Force.

Example is afforded us by the views placed at our disposal of the submerged Nanterre works of the Union des Gaz. One has only to glance at the pictures to see that the whole engineering and managerial faculties of the chief of the works (M. Paul Lhomme) and his staff had to be drawn upon to cope with a condition of things that opposed effectually all ordinary procedure and routine, and compelled the conduct of work on extraordinary lines amid the discomfort and inconvenience of the watery surroundings. They warred with unusual circumstances, and with an intractable enemy; and that they succeeded so well that, during the floods, only one commune of twenty-two supplied from these works suffered cessation of supply, deserves to be proclaimed a victory. Many other works in the near vicinity of Nanterre were not so fortunate, and were compelled to suspend the gas supply; among these, the large works lately built at Gennevilliers, from which the outskirts of Paris—a complete belt round the City—are supplied. Our sympathies, and those of all gas-engineering men, are with them in their misfortune.

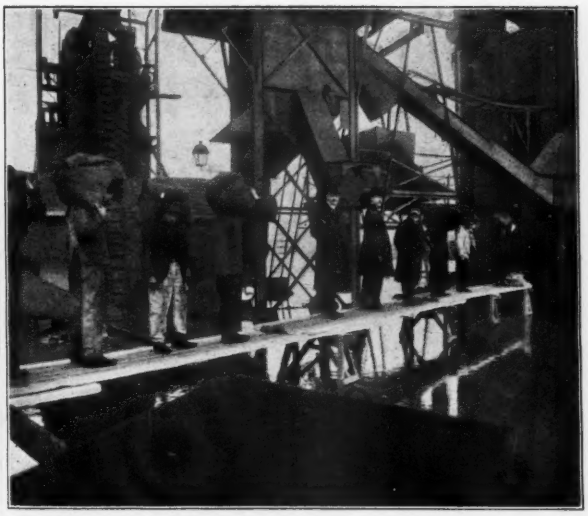
Those of our readers who desire to know the situation of the Nanterre works will, by following on the map the serpentine course of the Seine, find it to the west of Paris between two arms of the river. The old Nanterre works were some distance from the river; but the new (or comparatively new) ones are, for the convenience and economy of material delivery and dispatch, immediately (with only a tow-path between) on one of the banks. There was no escaping the flood; but by engineering prevision, when the works were laid out, the level of the site was raised some 6 feet. This saved the situation; for otherwise no amount of human ingenuity could have combated the swelling flood, and kept going the productive operations of the works. The first part of the works was only built in 1903; so that they are quite of modern type in all respects—in fact, this is seen in the illustrated description that appeared in the "JOURNAL" some time since. The carbonizing plant consists of two benches, of, in all, seventeen settings of nine retorts. The average production of the works is some million cubic feet per day. How nearly these benches were put out of action by the water will be recognized by the fact that—though the ground-floor entrances to the retort-house were partially bricked-in, and though the coke was thrown out of the discharging-stage floor windows, both for the purpose of disposing

The Retort-House Entrances Partially Bricked-up.

[With a Barricade formed by the Coke from the Retorts being thrown from the Discharging-Stage Floor Windows.]



Means of Transport from Coal-Store to Charging-Stage.
[At the Coal-Store End of the Temporary Bridge.]



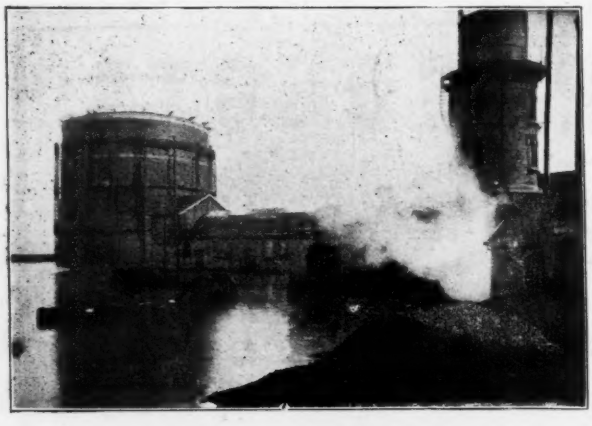
Means of Transport from Coal-Store to Charging-Stage.
[At the Retort-House End of the Temporary Bridge.]

of it, and for forming a sort of dam (as seen in one of the illustrations) to the flood waters—the water flooded the furnace ash-pans, and rose very nearly level with the fire-bars of the producers. It should be explained that the coke-conveyor could not work owing to the failure of the electric current by which it is driven. In another picture we have a view of the coal-store, isolated by the waters, but with the space between it and the retort-house bridged by a temporary wooden footway above the waters, and across this coal

The Purifier-House (with Elevated Purifiers, and Charging and Revivifying Floors), Machinery Room, and Governor-House.

was carried by men for keeping the retorts going. Under ordinary working, the coal is raised from the delivering barges by a West gravity-bucket elevator, deposited in the store, and from there is conveyed to the retort-house by a cross conveyor running in a culvert underground. The view showing men on the temporary footbridge at the retort-house end, also illustrates the coal

A Broad Sheet of Water.
[A more Extended View of the Part of the Works illustrated by the Above Photographs.]



A Gasholder Surrounded by Water.

handling plant disabled by the flooding of the underground culvert. In the pressure and machinery rooms, the water stood at least a foot above the floors.

The photographic views speak with greater descriptive force than mere words as to the difficulties of the situation. But there was good generalship throughout; and the men and all concerned worked willingly and loyally to do their level-best amid their strange environment. Stokers, yardmen, and others remained on the works, and were quartered in the upper stages of the retort-house. Progress about the works could only be effected by boats and horses and carts. In certain parts, however, the current was so strong that the boats could only make way by hauling-lines specially fitted up for the purpose when the water began to rise. The water at the entrance to the works mounted almost to the first floor of the dwelling of the foreman and his assistants, and temporary quarters had to be provided for them in some of the other buildings.

Productive difficulties within the works were supplemented by the trouble of preventing the distribution system becoming water-logged. Men were placed on point-duty in fixed boats throughout the twenty-four hours to keep the syphons free; and these men were relieved at intervals by boat.

Nothing was neglected. Duty called for the gas supply from the works being maintained, if humanly possible, despite the intervention of Nature in one of her worst moods. And in all but one commune there was success. But not one of those who had part in it will desire a recurrence of the to them unique experience.

THE MAINTENANCE OF GASHOLDERS.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

The working life of a gasholder can be extended indefinitely by the exercise of regular supervision, painting, &c., as often as necessary, and attention generally to working details. On the other hand, the certain penalty for neglect, whether occasional or permanent, is a heavy bill for repairs and renewals. If once the skin is allowed to get into bad condition, it is a more difficult and more expensive matter to get the surface right again than to maintain it in proper order. These remarks may appear so obvious as to border on the superfluous; but in these busy days, when the manager is expected to devote a considerable portion of the time that formerly went to caring for and nursing the apparatus and plant to similar duties among the customers, these little details, so necessary to successful gas-works management, are apt to get crowded out. Another contributory cause is the fact that the slack season has become a thing of the past, to the satisfaction, no doubt, of the financial department, but with some increase in the difficulties of keeping the plant in good going order. The consumption, say from May 1 to Aug. 31, was formerly so low that any part of the plant could be spared for overhauling without difficulty, and opportunity could be found for a general clean-out of the hydraulics, foul mains, condensers, scrubbers, connections to purifiers, examination of, and rubbing down, the faces of dry-faced valves, and of attending to the between wind and water lines on the purifier lids and gasholders. But while the annual consumption of gas has doubled within the last 20 years, the summer consumption has increased threefold; and while the facilities for attention to these little matters have diminished, the need for them has increased, because the whole of the apparatus is, if one may use the expression, in more rapid use, and is expected to pass a larger quantity per annum—*i.e.*, to do more work—than formerly. Systematic attention and repairs are more necessary than ever; and a manager who allows the increasing difficulty of dealing with them to be an excuse for neglect, is certainly laying up trouble for the future. In designing new plant, the point should not be overlooked; and care should be taken that, as far as practicable, the whole of the plant can be overhauled, cleaned, painted, &c., without interference with the make of gas.

These remarks are suggested by an inquiry, which appeared in the "Journal" for Feb. 1 (p. 308), as to the best way of repairing leaky gasholder plates, and which was evidently propounded by the manager of a small gas-works. As this is a matter in regard to which prevention is better than cure, attention may first be directed to the cause of the trouble. The intention to repair gasholder sheets or anything else, involves the assumption that the apparatus is worth repair. In this case, were the sheets too thin in the first place? On account of the extra strain and exposure to which the top and bottom rows of sheets on each lift are exposed, it is usual to provide a thicker gauge for them than the remainder. If there is nothing wrong with the quality or the thickness of the sheets, has the supervision been a little at fault? In small works, steam is not always used, even if it is available, for thawing ice in frosty weather, and the holder may at times become ice or snow bound, or the sheets may be injured by the use of a heavy bar for breaking the ice. Even where painting is regularly practised, the difficulties of getting at the lower few inches lead to that part being neglected altogether, hurried and inefficiently cleaned before painting, or let under water before the new coat has a chance of getting properly set, all of which tend to a more rapid corrosion than in other parts of the holder.

Some account of the way in which a similar difficulty was overcome may be of use to your correspondent. About 15 years ago, it was necessary to deal with an 80 feet gasholder that was badly gone at about the same locality—viz., just at the "between wind and water" line, when the holder was full. There were not two other holders available in this case, and in fact it was the only one on the works that would give a sufficient pressure during maximum consumption, and it could not be spared even for three days at a stretch. The remark about being able to lay off the holder for three months in the summer if required, has a refreshing old world sort of flavour about it. But in this example, the holder could not be spared for at least a twelvemonth ahead, for it had developed not 4 or 5, but more like 40 or 50 perforations, all within a space of a few inches above the bottom curb. The holes were small, the largest not $\frac{3}{8}$-inch diameter, the weight and quality of the plates were satisfactory, and the only available explanation was that a pointed bar had been used for breaking the ice during a severe winter. Having ascertained that the plates were strong enough to be worth repairing, the matter was taken in hand by a qualified blacksmith, who felt confident of being able to make a satisfactory job. Each hole was rounded out to the smallest circle that would cover it, after removing all rust or loose scale, and was filled by means of an L shaped bolt, screwed on the short end, and temporarily held in place by a wire-hook. A plate of thin sheet iron of suitable size was placed over it, having first been coated with red lead paint of sufficient consistency to form a solid joint when screwed up, then a large washer and a nut. After screwing up a turn or two (sufficient to grip the bolt), the wire was removed and the patch screwed up tight. When all the holes had been so stopped, the holder was filled as full as possible, and a coating of hot well-boiled tar was laid on all round. Some little ingenuity was needed to keep the coating well above water until it was quite set. This work was done in the summer of 1904, and the holder is in use to-day. The use of the bar for breaking ice in regard to this tank or any other part of the works has been abolished. A steam supply with connections at intervals for some flexible metallic tube, enables steam to be applied wherever required. The holder has had the same attention as the remainder of the apparatus, and it is as sound to-day as when the job was freshly done.

If the holes are small, it is possible that your correspondent, by following this plan, could keep it in going order for some years. But if, in addition to the holes, there is reason to believe that the plates are seriously corroded, the question of a new row of sheets must be considered. And unless the querist or his workmen have some general experience in construction and repairs of ironwork, it would be very much the wiser plan to place the whole matter in the hands of a reliable firm. While the work is in hand, it will be well to examine the guide pulleys, both top and bottom, to see that each one is working truly, not running loose on the one hand or binding on the other and that the axle pins are properly lubricated. The guide-framing may also be examined, having a special eye to oval bolt holes, contact parts between L bars, or where lattice work crosses, as corrosion may go on to a dangerous extent in any crevice that habitually holds water. Telescopic holders call for even a greater amount of care, as neglect of the lutes and other working parts may lead to the throwing out of a large holder at a time when it is urgently needed. Very often the holder is so situated as to receive frequent clouds of dust from the retort-house, coke yard, oxide sheds, &c.; and in this case the lutes should always be thoroughly cleaned out once a year. An appreciable quantity of mud will be found under these conditions. Having cleaned the lute, the water can be lowered by means of a bent syphon for a few inches, or as much as is safe, so as to give an opportunity for coating the "between wind and water line" with boiled tar as described.

The wind and water line also occurs in water-sealed purifier boxes, in iron store tanks, and many parts of the works; and wherever it may be, an annual inspection, cleaning, and painting will be work well spent.

In addition to the contributions of the European Gas Company and Sir John Aird, Bart., to the Mansion House fund for the relief of the sufferers from the Paris floods, as mentioned last week, the Imperial Continental Gas Association have sent £105.

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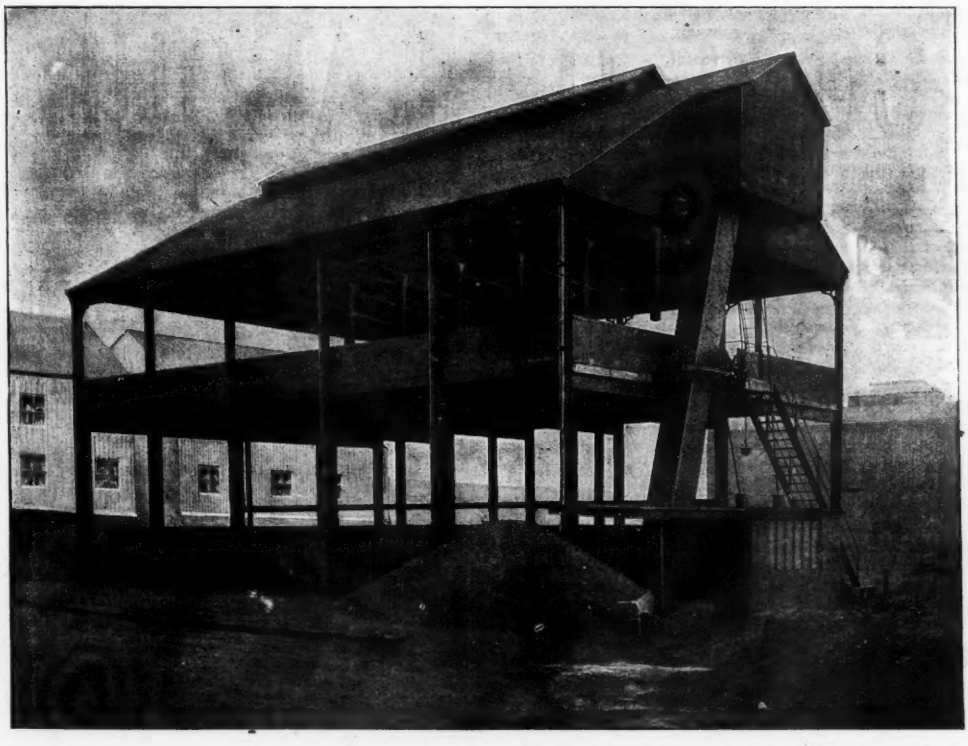

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VICTORIAN GAS MANAGERS' ASSOCIATION.

Fourth Annual General Meeting—Nov. 3 and 4, 1909.

The Fourth Annual Meeting of the Association was opened on Wednesday, Nov. 3, 1909, in the rooms of the Victorian Institute of Engineers, Swanston Street, Melbourne. Mr. P. C. HOLMES HUNT, the President, occupied the chair. There were 31 members present.

The PRESIDENT, in opening the proceedings, said he was sure the members ought to feel very gratified at seeing so goodly an array present. He was very pleased also to see so many visitors from New Zealand and the other States of the Commonwealth with them. They had the satisfaction of welcoming among them Mr. Hungerford, of Dunedin, and Mr. Rabbidge, of Invercargill, New Zealand; Mr. Scholes, of Ipswich, Queensland; Mr. Barson, of Broken Hill, Mr. Ambrose, of Bathurst, and Mr. Kempster, of Waratah, New South Wales; and Mr. Allan, of Hobart, Tasmania. He hoped they would have a very successful meeting, and that the conference would prove highly enjoyable. The first business of the day was the report and balance-sheet.

REPORT AND ACCOUNTS.

These having been presented and taken as read,

The PRESIDENT moved that they be adopted. He said there was nothing in them to which he need draw special attention with the exception of the paragraph of the report which dealt with the state of the finances. There was again a slight debit balance, in spite of the fact that last year the subscription was raised. The Council thought it better to bring the matter under the notice of members, and ask them to decide what was to be done to meet the deficiency, and how to arrange for them to pay their way better in future.

Mr. T. LORD (Geelong) seconded the motion, and it was carried.

The PRESIDENT said it was now open for the meeting to decide whether the subscription should be raised.

Mr. J. BOWMAN (Sale) said he should like to know whether, if the subscription was raised, it would be of any special benefit to the Association. Was the money needed for anything? He noticed that they were £2 12s. 9d. better off this year than last in the amount of the debit balance, which had been reduced from £4 11s. 10d. to £1 19s. 1d. He did not know whether it was really necessary, as they were getting better off, to increase the subscription.

The PRESIDENT said there did not appear any special expenditure ahead of them; but they were, of course, anxious to pay their way. Under present circumstances, if they simply increased their membership they would certainly be in a better position. Still, he should like the members to consider the matter of increasing the subscription.

Mr. W. FROST (Mornington) remarked that, inasmuch as they had reduced the debit balance—and he supposed there were new members joining whose subscriptions would be available—he did not see any necessity for increasing the annual subscription. If the Executive could give them any reason why they should increase it, they might consider the idea.

Mr. F. TIPPER (Fitzroy) said he should like to point out that at present they did not properly pay their way. They were really financed by the Secretary from one year's end to the other. He thought, if the Secretary were asked, he would tell them he had to use his own money for Association purposes and for the present meeting. He considered it was a great mistake, for the sake of a 5s. subscription, to keep the Executive of the Association short of a pound or two.

The PRESIDENT said the matter did not come before the members in any way other than as a recommendation from the Council to consider the question of increasing the subscription; but if anyone would move a resolution, he would receive it.

Mr. F. TIPPER (Fitzroy) moved that the annual subscription be increased to £1 1s.

Mr. J. LORD (Williamstown) seconded the motion.

Mr. J. BOWMAN (Sale) said that, in order to ascertain the feeling of the meeting, he would move an amendment that the subscription remain as at present—viz., 15s. per annum.

Mr. W. FROST (Mornington) seconded the amendment.

The HON. SECRETARY (Mr. C. W. Howlett), in speaking to the motion, said he might point out that on starting the Association the subscription was fixed at rather a low figure. They hardly knew at the time what their expenditure would be. On taking office, he found that his predecessor had been put to a great deal of expense in conducting the Association's affairs. They certainly made up a little ground by increasing the subscription last year, and they had also received an addition of four or five members to help them along; but if they had the misfortune to lose any, it would place them in the position of having to work from hand to mouth. His own idea was that to work the Association properly they should have more money at their disposal. He would point out one case of how this shortage affected them. They had been granted the use of the room they at present occupied for their meeting; and up to the present had been allowed the use of rooms for all their meetings. He thought it was time that a body like theirs should be in a position to give an honorarium for the use of the rooms; but they could not at present do so. He considered they should place their officers in the position of feeling a little independent. The information that was received through the Association and from the debates recorded in the proceedings was really worth a guinea a year; and he did not think anyone should grudge that sum.

The motion and the amendment were then put to the meeting; but only the mover and seconder voted for the latter. The motion was therefore declared carried.

NEW MEMBERS.

The HON. SECRETARY then read the following nominations for membership, as approved by the Council; and they were duly elected:—

W. H. Mutton, Manager of the Shepparton Gas-Works.
John Saunders, Manager of the St. Arnaud Gas-Works.
S. W. Beale, Manager of the Frankston Gas-Works.
A. M. Humphrey, Manager of the Hamilton Gas-Works.
L. Rodgers, Manager of the Warrnambool Gas-Works.
T. H. Webb, Manager of the Albury Gas-Works.

ALTERATION OF RULES.

The PRESIDENT then submitted a motion of which he gave notice at the previous annual meeting—"That the following addition be made to Rule 4: 'The retiring President shall remain a member of the Council for two years immediately following his year of office.'" He said this proposal was approved by the last annual meeting, and it was agreed at Ballarat that it be forthwith acted upon. This had been done; but in accordance with the rules, he now moved that the words be added to Rule 4.

Mr. T. LORD (Geelong) seconded the motion, which was carried.

The PRESIDENT then delivered the following.

PRESIDENTIAL ADDRESS.

Before attempting to address you to-day, allow me to thank you most sincerely for electing me to this high position. I am proud to occupy the Presidential Chair so early in the life of the Association, and in immediate succession to our first three Presidents, who have been so long and honourably associated with the gas industry in Victoria. Our meeting this year is honoured by the presence of several gas engineers and managers from New Zealand, New South Wales, Queensland, and Tasmania, who have travelled long distances in order to be with us to-day. To them I offer a very hearty welcome; and I trust their presence here will be to the mutual advantage of all.

It may be fairly said that our Association is now based on a thoroughly sound foundation; and, as evidenced by the excellent attendances at our annual meetings and the increasing desire on the part of members to take part in the proceedings, any doubts which may have existed at the first as to its success have vanished. Our Association is, I venture to say, proving of considerable use; and year after year it must become of greater benefit still to all of us engaged in managing works in Victoria—the majority of which are in small towns scattered over the large area of our State. Our annual meeting and the yearly interchange of experiences and discussions on various matters, cannot fail to be of considerable benefit to our daily work, and must quicken in us the gas instinct, and so stimulate us to improve still more on our best results. Yet I would urge on all members the necessity of constant and continued co-operation in order to ensure the success of our annual meetings—co-operation which can only be made real by the offer of papers and the thorough discussion of all subjects brought forward. May I point out, too, that all recognize that managers, even of the smallest works, meet with difficulties, maybe of a unique character, and that information on any point is always available through the Question-Box? It appears to me that, apart from affording facilities for managers to meet and discuss technical matters, our Association might be made useful in other ways. For instance, might not advantage accrue by the appointment of a small Standing Committee to act as a Vigilance Committee, whose duty would be to watch the interests of the industry in so far as they might be affected by contemplated legislation or other outside developments?

You are probably aware that our *confrères* in New South Wales and Queensland have decided to form an Association; and we must congratulate them most heartily on this step—indicating as it does the flourishing condition of the gas industry in our sister States. The determination arrived at in New South Wales and Queensland may surely be indicative of the gradual coming together of all who are engaged in our industry throughout Australia; and, even if it does not portend the eventual formation of one Association, comprising all those engaged in gas-works in the Commonwealth, it would be well worthy of consideration on the part of all of us as to whether it would not be possible to hold a combined meeting of the different Gas Associations every few years—the meetings to take place alternately in the principal cities.

COAL.

The all-important question to gas managers—the price of coal—continues to give all those connected with the industry very

considerable anxiety. Coal prices are now much more than they were a few years ago; and it is certainly difficult to see what there is to justify such an increase—the price to the majority of works in Victoria being, I suppose, at least 33 per cent. more than it was five or six years ago. Whatever is the effect of the combination of coal proprietors in Newcastle on their own business, there can be no gainsaying the fact that such a combination, or "vend" (as it is called), acts most adversely to the interests of the consumer; competition, that great safeguard of the public, being practically eliminated from the coal trade. It would seem that the combine has determined to continue to ask high prices for coal; for, despite the fact that trade at home, and, indeed, throughout the world, is at present very indifferent and business in Newcastle bad, there does not appear to be any inclination to lower prices, and give the Australian consumer the benefit. Does it not seem, rather, to indicate that the main result of this combination is to make the local consumer and the old regular customers of the Newcastle coalfields pay a high price for coal—higher, indeed, than foreign customers—because it is difficult to imagine that the Australian product, at the present-day f.o.b. price at Newcastle, can compete in the world's markets with the cheap coal recently obtainable at home? Doubtless you saw a report in the Daily Press a few weeks ago that a certain ship was refused a cargo of coal at Newcastle because she was not included in the list of vessels authorized to be loaded by collieries connected with the vend. Surely there is something wrong when such arrangements are possible!

Looking at the coal position from our particular point of view, it is unfortunate for the gas industry in Australia that it has practically to look to only one coalfield for its supplies of raw material; for although there is coal—and good gas coal, too, I believe—mined in Queensland, yet it appears impossible to obtain supplies in anything like large quantities. We in Victoria are in a worse position than either of our two eastern sister States; and we look forward with considerable interest to the development of the Powlett River field, which has lately been proved to extend over a large area of country. Through the courtesy of Mr. Stanley Hunter, of the Mines Department, I have recently had the opportunity of testing a small sample of the coal. The result was certainly encouraging; for, despite the fact that the sample had been at grass for several months, exposed to the severe weather of last winter, a good yield of gas was obtained. Whatever the quality of this coal may turn out to be when it is produced in bulk, in so far as gas-making is concerned, we cannot but congratulate the Victorian Government on its determination to thoroughly test and open up the field. This is not the place to discuss the *pros* and *cons* of the knotty question as to whether the State should establish its own coal mine; but it is to be hoped that no lengthy time will be taken in developing the field, and that it will be carried out with the greatest possible expedition.

Speaking of coal naturally leads me to refer to the magnificent field of rich coal which has of recent years been developed in the Maitland district of New South Wales. During the past year, I have had the opportunity of inspecting several of the collieries in that district, and I was much struck with the complete equipment laid down at the various mines for all operations. The Maitland coal—somewhat of a non-caking character and rich in volatile hydrocarbons—approaches the nature of cannel, though making an altogether superior coke to the latter. It is, as you are aware, very hard and close-grained—some of it being in this respect almost like pitch; and the seams worked in the majority of the mines are particularly free from band and dirt. The field is situated, for the most part, in charming country, and many of the pitheads have been erected in virgin bush. Evidence, too, of the way population follows the mines is strong; townships having sprung up at all the collieries.

On the experimental scale, and using iron retorts carbonizing 56 lbs. per charge, I have tested samples of coal from all the South Maitland collieries; and eleven samples gave the following average results:—

Gas Made Per Ton. Cor. Bar. & Ther. Cub. Ft.	Illuminating Power by 15-Hole Argand Burner at the 5 Feet Rate. Candles.	Coke Made Per Ton. Cwt.
12,248	15·93	11·75

The sperm value of the South Maitland coals does not vary very materially, and the majority should yield a large quantity of gas of fair illuminating value.

What, however, must finally determine the selection of a Maitland coal is not only the yield and the quality of the gas, but the quality of the coke produced; and several of these coals produce a better coke than others. I may say, too, that in the ordinary method of working—*i.e.*, the laying of a charge of coal on the bottom of the retort—all these Maitland coals give a "short," small coke. From experience in Melbourne for some months past, I have come to the conclusion that, in order to get the best coking results, the Maitland coals should be carbonized under pressure. By that I mean slightly packed in the retort, in the manner in which the projector type of machinery enables the gas-maker to do now. We find that, working with De Brouwer machinery, and using heavy charges—*i.e.*, 8 cwt. or more—the resultant coke is much better than that produced when the coal is, as I have said, laid in the retorts by other means, or allowed to run in by gravitation, as in the inclined system, though I believe that if inclines could be completely filled, the coke produced would certainly be of good quality.

It is a matter for regret that the Newcastle coals, or what are known as the "Delta" coals, are being so rapidly worked out, and are not maintaining their quality; and the present position indicates that in a short time there may be only one mine working producing coal from Newcastle suitable for gas-making purposes. For, although the yield of gas from Maitland coals is undoubtedly greater than that obtained from Newcastle, yet the yield of coke is much less, tar slightly less, and ammonia rather more; and when the value of the coals is reduced to a commercial basis, having regard to local conditions, it may be a question whether, in turning to the Maitland field, we shall obtain coal which will prove such a good all-round gas coal as that from Newcastle. To the gas-maker, however, such a raw material as the Maitland coal, which will yield a large volume of gas, offers considerable attraction; and, so far as my study of it has gone, I am driven to the opinion that we are not yet carbonizing it in the best way to obtain the highest possible results. I shall refer later to the matter of carbonizing. But here let me say that I am not sure that we are able yet to realize the potentialities of the Maitland coal; and when we can carbonize it in vertical retorts, there is probably a surprise in store for us.

RECENT PROGRESS IN THE GAS INDUSTRY.

Turning our eyes homewards, we see that much has taken place in the gas industry there during the past year. This progress may be summed up under three headings—

1. The advances in carbonizing.
2. The first adoption of a calorific power standard.
3. The largely-extended adoption of co-partnership.

CO-PARTNERSHIP.

Referring first to the last-named, it is a notable fact that a number of gas undertakings have now adopted co-partnership—one of the latest being the Gaslight and Coke Company of London, which is the largest gas undertaking in the world, and whose co-partnership scheme embraces over 8000 officers and workmen. All the London Gas Companies and many provincial ones have adopted this method of amalgamating the interests of consumers, shareholders, and employees—all of whom automatically benefit by the progress of their undertakings. The adoption of co-partnership by so many companies must assuredly be establishing the finest memorial to the memory of its founder, Sir George Livesey, who did so much for it, and proved the advantages to be derived from it, over a period of twenty years. The employees of the South Metropolitan Gas Company—the undertaking over which, as you know, Sir George presided—have received as bonuses under the scheme the large total sum of £419,000; and this year, with the price of gas reduced to 2s. 2d. per 1000 feet, the bonus is 7½ per cent. on salaries and wages.

THE CALORIFIC POWER STANDARD.

As regards the calorific power standard, I would remind you that for the first time in the history of the gas industry a standard calorific power has been prescribed by the Imperial Parliament for a gas undertaking, the Company being the Gaslight and Coke Company of London. The standard imposed is 125 calories per cubic foot—equal to practically 500 B.Th.U. net. Penalties, however, are not to be imposed unless the heating value drops 10 per cent. below the figure named; so that the standard really becomes 112·5 calories, or about 450 B.Th.U. net. Looked at from our limited point of view, the standard strikes me as being a fair one; and I am inclined to question whether it will be advantageous to aim at supplying heating gas of a lower standard than the last-named figure. As time goes on, we shall doubtless learn more about the control of calorific power, which we know little or nothing about at present; and this will probably come about when we are able to approach nearer our ideal—a cheap heating gas—more suitable than an illuminating gas for modern requirements. But at present, at any rate, the standard cannot be a hard one for any gas undertaking to work to. It must be noted, however—and very regrettably, too—that the adoption of a standard calorific test is not accompanied by the abolition of the illuminating power test, for since it is proved that heating value and illuminating power do not follow each other, any inducement in manufacture that a standard calorific power may offer must surely be considerably nullified by having to maintain a candle power standard. Such a revolution, however, could not perhaps be looked for all at once; and the British characteristic, to "hasten slowly," doubtless guides the change somewhat. At the same time, however, both British and Colonial gas undertakings must assuredly fall into line with the up-to-date methods adopted on the Continent of Europe; and we cannot but read this innovation as indicating what the future may bring forth. It should mean much for the future of gas supply; for, since a heating gas is now required for all purposes in place of an illuminating one, a heating standard should surely be worked to, and the sooner we work to it, the sooner, surely, shall we learn how to control it.

When the change in this matter takes place in our part of the world, I hope that our present candle-power test will be done away with. In Melbourne, we have to test with candles using a 15-hole argand burner with a 7-inch chimney; and in a climate such as ours, where often the air temperature in the testing rooms is over 90° (and that for days together), the absurdity of trying to get decent tests with candles is, of course apparent.

As indicating the amount of gas now used solely for heating purposes, I may mention that our day output in Melbourne is, on the average, rather more than 45 per cent. of the total; and during the summer months the proportion is over 50 per cent.

The following table gives the proportion during each month of the year ending June 30, 1909 :—

Month.	Day Output.	Night Output.
July	36·98 per cent.	63·02 per cent.
August	35·11 ,,	64·89 ,,
September	44·30 ,,	55·70 ,,
October	45·05 ,,	54·94 ,,
November	52·71 ,,	47·29 ,,
December	53·23 ,,	46·77 ,,
January	56·39 ,,	43·61 ,,
February	54·49 ,,	45·51 ,,
March	45·98 ,,	54·02 ,,
April	46·36 ,,	53·64 ,,
May	36·32 ,,	63·68 ,,
June	37·88 ,,	62·12 ,,

The day output is, of course, due to the stove, gas-engine, and industrial consumption. In regard to engines, our consumption has been affected to some slight extent by the adoption of suction producer plants (which, however, invariably have a town gas stand-by); but there are upwards of 900 engines connected to our supply. The night output is almost entirely, I believe, consumed in incandescent burners. In fact, I doubt if the latter are used more universally by gas consumers in any other country. What need, then, for any test of illuminating power?

It has been said, and I think with considerable force, that the gas companies can well be left alone in the matter of standards, and that it is high time such legislation came to an end—it being argued that the gas company knows best what its consumers want, and, knowing this, can be depended upon to supply it in its own interests. There is, I think, considerable force in this. Gas undertakings are now working under very different conditions from those existing a few years ago, and the healthy competition from the electric light is sufficient alone to make a gas company study the wants of its consumers. Anyway, it does seem strange that, while a gas company is compelled to maintain a standard illuminating power, and work under certain conditions, yet our competitors, the suppliers of electricity, have no illuminating standard to work to, are not required to have their meters certified by the municipal authorities, and are even allowed to charge rent for them.

CONSTANT QUALITY AND PRESSURE.

Mention of standards brings me to consider distribution. Here I may express my opinion that while the gas, to meet modern requirements, should be primarily a heating gas, yet that gas, of whatever standard, requires to be maintained at a certain quality, with a minimum of variation, and supplied at as constant a pressure as possible, so that, whatever hour of the day or night a consumer may use his burners, he may be sure of obtaining the same satisfactory light. It is the variations that trouble and annoy the consumer; and it matters nothing to him whether the gas be 13, 14, or even 17 or 18 candle power, so long as his burners are properly adjusted for the quality supplied, and that quality constantly maintained. As to whether the ideal condition of supply I have named can be obtained in practice, I cannot say. To me it appears to suggest the extended use of high-pressure mains throughout the area of distribution, connected through governors into the low-pressure mains, and by which arrangement the pressure in the latter can be automatically backed-up as necessary. Some such system has, I understand, just been installed by Mr. Robert English at Christchurch, New Zealand, and must, I feel, make headway in other cities. There is a limit to the simple, but somewhat crude, method of increasing pressures at the works in order to give a better supply in outlying districts.

THE COMPLAINT AND INSPECTION DEPARTMENT.

But the distribution of gas not only covers its supply, but also all the wants of the consumer attendant thereon, and its sale; and in this department great development in methods has taken place during the past few years, mainly the result of competition. Every gas company to-day is, I think, imbued with the necessity of adopting up-to-date methods; and every official of an undertaking must be alive to the possibilities of competition, and ever keen to increase consumption. In the case of very small companies, the manager will often find the distribution and sale of gas more important, and demanding more supervision, than the retort-house, provided always that the latter is equipped with an economically designed gaseous-fired furnace or semi-regenerator. It is certainly necessary, therefore, for the manager to know how to sell gas quite as well as how to make it. So the "twenty-four hours man," as he is sometimes styled, must be undoubtedly an all-round individual; and in such cases the secret of his progress is the knack of keeping in touch with his consumers. In undertakings of a larger size, a well organized complaint and inspection department (as part of the distribution department) is an absolute necessity; and the times demand that this department must invariably do a certain amount of free maintenance in order to keep in touch with consumers. By free maintenance, I mean the adjustment and regulation of burners—work which, I feel, must hereafter increase rather than decrease. In Melbourne, we pay considerable attention to our Inspection Department; and a short description of its organization may be of interest to you.

In the first place, the whole of our distribution area (which covers, roughly, 85 square miles) is divided in five districts, each under an independent foreman, who is responsible for the work of his district to a chief complaint inspector at the head office, and to the stove and fittings superintendent. In each district, two or more depôts are established, as required, and are the headquarters of a number of fitters and inspectors, who are allotted a certain "beat" in the particular area centring round the depôt. These inspectors carry out the whole of the work, including the fixing of stoves and meters, and attend to all complaints—stocks of meters and all material being carried at the depôts. Here, also, youths employed on local maintenance work have headquarters. All the depôts are in direct telephonic communication with the head office; and every endeavour is made to attend to complaints on the same day as received—no man being allowed to leave the depôt at night until he knows definitely that there is no important job to be attended to in his inspection area. Special attention is given to all complaints; and the inspectors are instructed and trained to do everything to help the consumer. Lectures to the fitters and inspectors are periodically given by the superintendent; and special classes for the juniors and boys are held once or twice a week during the winter months.

The old policy of having nothing to do with the consumers' fittings has long since passed away; and wherever an alteration or overhaul is necessary, and the consumer is willing to place the order with us, the work is undertaken as expeditiously as possible. We have found it absolutely necessary to do this in self-defence, owing to the deplorably bad work which has been done in the gas-fitting line in the city and suburbs, and which, of course, simply brings gas into disrepute. Joints and leaks merely puttied over and bandaged up are frequently found by the fitters; while compo. joints—which are really nothing more than blocks to the gas passage—and piping too small for requirements, are matters of almost every-day attention.

It is on account of this bad fitting work, and the increasing necessity, as the result of competition and incandescent lighting, to keep in touch with the consumer, that my Company came out into the open, as it were, a few years ago, and extended this department in the manner indicated; and our experience is that the consumers are glad to know that the Company are prepared to undertake the work of putting their fittings in order. As illustrating the growth of this item, I may mention that in 1907 we did 9627 fittings jobs for consumers; and in 1908, 12,535. I may say also that, in addition to the ordinary staff of fitters and inspectors, we have a special number of stove inspectors, who periodically inspect and adjust stoves on consumers' premises.

We find the inverted burner making considerable headway. This is but natural when one compares the light given from (say) a properly-regulated "Graetzin" burner with any other light, be it gas or electric; and if only some of those fashion-following householders who imagine electricity to be the only suitable light, would seriously compare the two, I imagine that the inverted gas-burner would be selected every time on account of its clearness of illumination and cheapness. Inverted burners, however, are a very strong argument in favour of constant quality and pressure in gas supply. They are most sensitive, requiring most careful and accurate adjustment, and, to ensure a good result, a gas pressure of not less than 20·10ths.

I have indicated the necessity of an efficient complaint department, and a sales department also—all organized for the one object, the sale of gas. But in developing such arrangements, and adopting what, after all, are only sound commercial ideas, the necessity of which, however, did not appeal to the industry before the days of competition, we must not be led unwittingly into the idea that other departments are secondary to the distribution, and forget that the works, after all, are the profit-earning portion of the undertaking. The old adage, "that dividends are made in the retort-house," was never truer than it is to-day; and no gas company can afford to neglect the recognition of this fact. Where regenerative furnaces are already installed, the possibility of improvement is, of course, limited, though it is possible at the present day to considerably improve on the results from a carbonizing installation erected only a few years ago.

CARBONIZING.

In regard to carbonization, great advances continue to be made at the other end of the world; and it is doubtless true that in no department connected with the gas industry is progress so marked, or is close attention so well repaid. Retort-house practice has, during the past six or seven years, jumped forward by leaps and bounds; and as experience accumulates, and investigations are made, continued proof comes forth that the revenue account will benefit considerably by the adoption of up-to-date methods. These advances have been brought about by the introduction of improved plant and machinery, following, of course, the introduction of regenerative furnaces, whereby high heats are possible. First, there was the stoking machinery of the type where the coal is either laid on the bottom of the retort or pushed in, and the coke pulled out by mechanical rakes; then machinery of the projector type, with the pusher for discharging the coke; and the combination machine, automatically pushing out the coke and filling in coal; the hot-coke conveyor, the tar-tower, and the retort-house governor. Now we have the vertical retorts and carbonizing chambers, introduced within the last three years, and which are proving that carbonizing operations can be carried out very much cheaper than hitherto. Moreover, they have been the means of showing what perhaps is equally important to the gas-maker—that horizontal retorts can be made to do better work by the use of heavier charges. Thus it has been that the names of West, Foulis, De Brouwer, and Fiddes and Aldridge are being handed down to posterity as those who have done much to improve, not only the working results, but also the lot of the worker

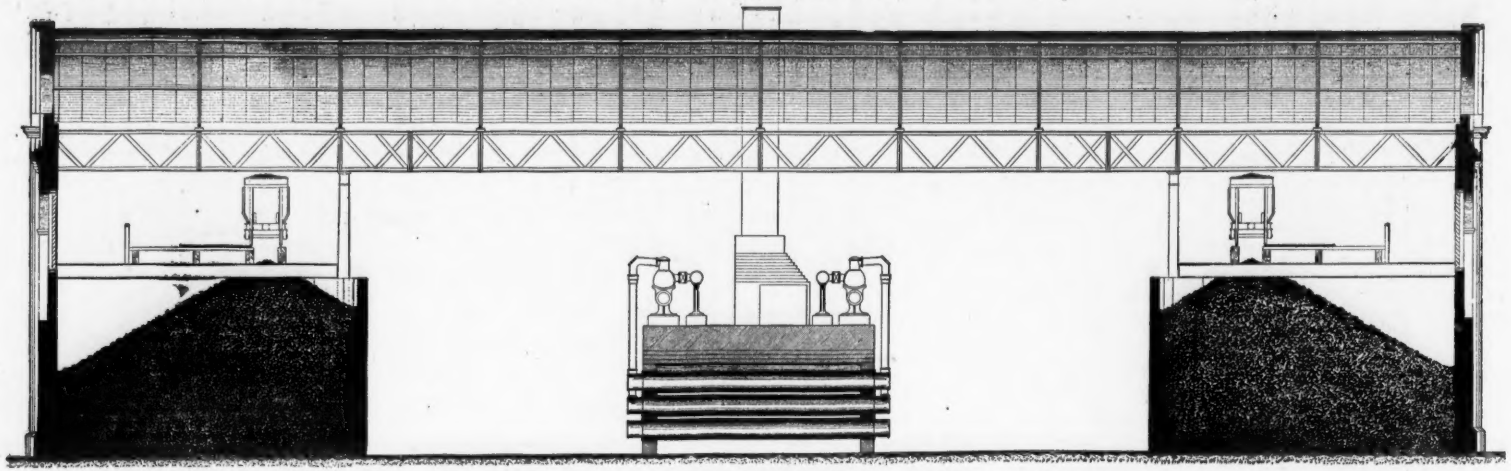


FIG. 1.—TRANSVERSE SECTION OF THE RETORT-HOUSE (ORIGINAL ARRANGEMENT).

Now history is being made by Bueb, Woodall and Duckham, and Glover and West, whose work is likely to result in the complete revolution of retort-house practice, and also, if not to solve, at any rate to lead the way to, the solution of the problem of cheap heating gas.

The progress appears to have proceeded along practically three lines:

(*a*) Vertical retorts worked intermittently.
(*b*) Vertical retorts worked continuously.
(*c*) Carbonization in bulk.

But all three aim at reducing the cost of production to a minimum. In regard to vertical retorts, it appears to me that if the carbonizing results from the Dessau system (which is the intermittent one), on the one hand, and the Woodall and Duckham and Glover and West systems (which are continuous), on the other, are practically the same, the adoption of a system must reduce itself to a comparison of the capital cost and labour charges. Still, continuous carbonization has a fascination difficult to set aside, whatever results may be obtained by any other system; and I would here like to record my admiration for the dogged perseverance of Messrs. Woodall and Duckham, in the face of many difficulties, through a number of years, to obtain a successful system of continuous carbonization. And if, indeed, success is theirs, as now appears to be the case, none will have deserved it more than they.

Despite the apparent advantages of the vertical retort, however, there is, to my thinking, an important point that requires clearing up before they can be adapted to Australian conditions. That point is the quality of the gas produced. Either it must be demonstrated that the vertical retort is capable of making gas equal to our standard, or our standard must be reduced before we can adopt it—provided always that the coals at our command will not give better results than those that are used at home. To thoroughly appreciate the value of quoted results, one requires to know something of the quality of coal used, and the conditions of working; but, so far as I can ascertain, the following results are the latest published of the various systems:—

System.	Make Per Ton. Cub. Ft.	Illuminating Power. Candles.	Calorific Power. B.Th.U.	Coal Used.
Dessau.	14,522	14·59	559 Gross	Boldon*
Dessau.	13,815	12·32	490 Net.	Silesian*
Dessau.	11,339	16·10	532 Net.	Silesian†
Woodall and Duckham. . . .	14,165	14·26	551 Gross	?Somerset
Glover and West.	13,102	15·56	514 Net.	Thornley

* With steaming. † Without steaming.

You will see from these particulars that, although the make of gas per ton is considerably higher than we are accustomed to, yet the illuminating power is lower than the standard we have to work to here. This point is emphasized, too, when we realize that the tests are made with the new Carpenter No. 2 "Metropolitan" argand burner. It is, of course, well known now that the test burner such as is prescribed for use in Melbourne for testing illuminating power depreciates the value of the gas; and when, a few years ago, Mr. Carpenter, then Chief Engineer of the South Metropolitan Gas Company of London, invented his burner, which can be used so as to give the proper quality of the gas being tested, it was immediately approved by Parliament, and is now being generally adopted for testing in Great Britain. In passing, and as noting the tendency to reduce the candle power of the gas, it is interesting to record that 42 gas undertakings at home have, during the past few years, been allowed, either by Act of Parliament or Provisional Order, to reduce their standard to 14 candles; and I believe that practically all these are testing with the No. 2 argand burner referred to. But so long as our standard remains as it is, we have to work with the old style of burner. Hence my remarks in regard to the candle power of gas produced in the vertical retort. The cost of production is, of course, much reduced by the use of verticals; and other advantages claimed include improved residuals. On the Continent of Europe many installations of verticals have been erected; and several are now on the point of completion in England.

From reports which have reached us, the development in regard to carbonization in bulk appears to have been great also; and formidable installations of these carbonizing chambers are now at work in Continental gas-works, carbonizing up to, I think, about 7 tons per charge. With these installations, however, there appears again to be the difficulty of illuminating power; for, judging from the reports, one must imagine they are so far specially capable of manufacturing a low illuminating power gas.

The possibility of carbonizing coal in large quantities for the production of gas, possesses an undoubted attraction; and I remember, when I was first beginning to learn something about gas-making years ago, taking a little part in the tests on the working of some coke-ovens, just prior to Mr. Charles Hunt reading his paper, on "Notes on Residuals," before the Institution of Gas Engineers in the year 1896. Returning from a visit to the coke-ovens, I was led to wonder how such a system could be adapted to ordinary retort-house designs; but though I took the foreman of the works into my confidence, no practical solution of the proposal was forthcoming. My idea ran on the lines of using the main arches as existing, and placing in them three ovens in place of nine retorts. The idea, so far as it went, appeared feasible. But what puzzled me was how to fill up the ovens with coal, as it was altogether out of the question to adopt the ordinary method used in a coke-oven installation, of running the coal in through holes in the top arch. I am not a little interested now to see that Mr. Thomas Glover, of Norwich, has, by the ingenious

will not give better results than those that are used at home. 18 | 14 candles; and I believe that practically all these are testing | to see that Mr. Thomas Glover, of Norwich, has, by the ingenious

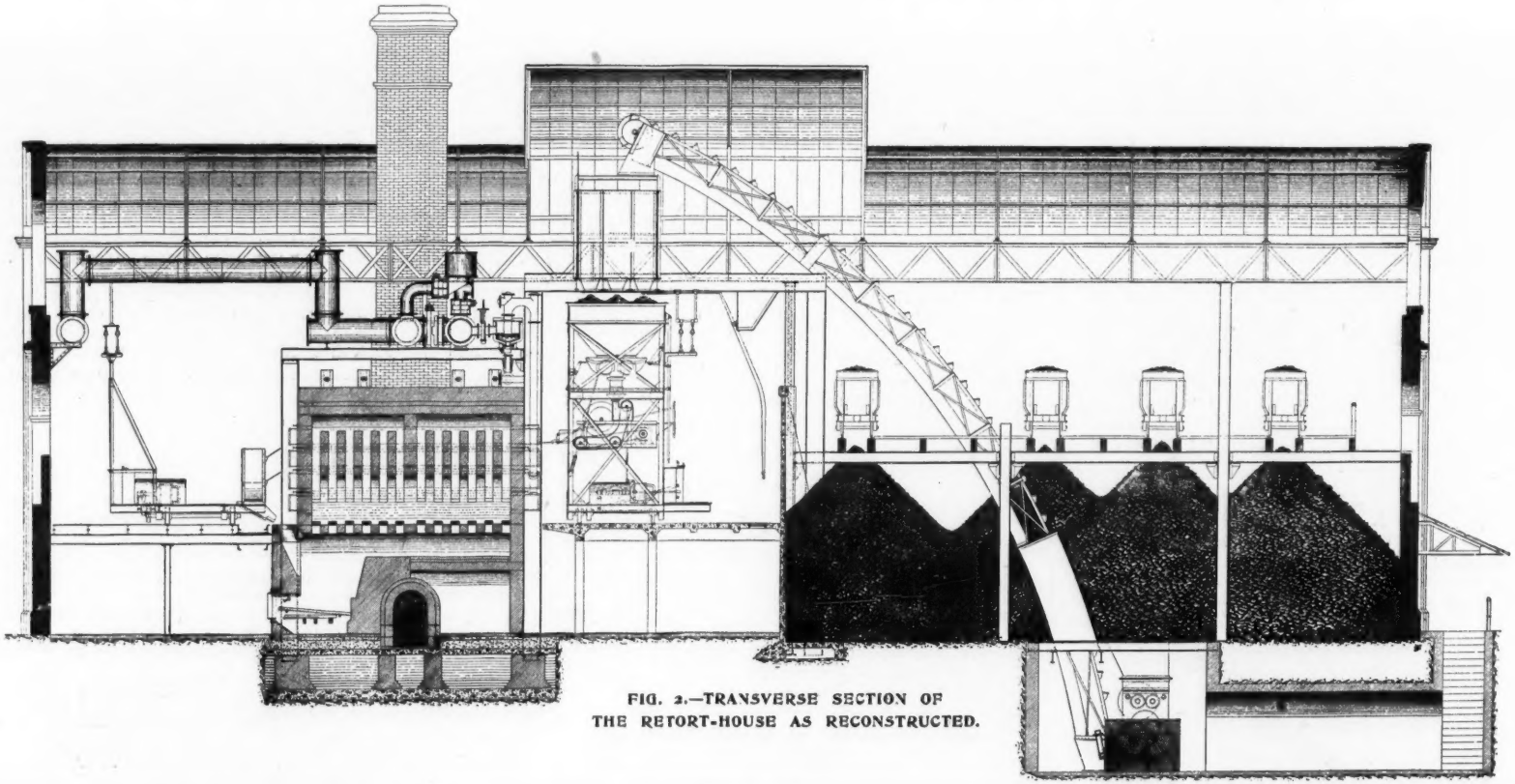


FIG. 2.—TRANSVERSE SECTION OF THE RETORT-HOUSE AS RECONSTRUCTED.

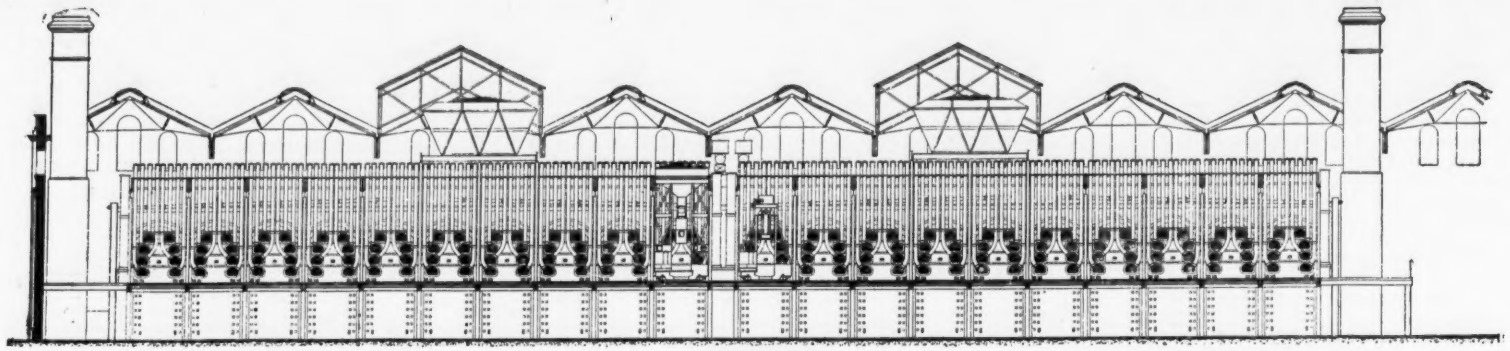
adaptation of the D3 Brouwer charger, successfully demonstrated how to fill an oven with 1-ton charges. By the substitution of six ovens, 36 inches deep, by 12 inches to 13 inches, and 21 feet long, in lieu of ten retorts, and carbonizing 21 cwt. per oven in twelve hours, Mr. Glover appears to have increased the carbonizing capacity of his setting by 5 per cent.; while, in addition, he is able to produce a special quality of coke, and so meet a certain local demand for coke of hard quality.

RECONSTRUCTION IN MELBOURNE.

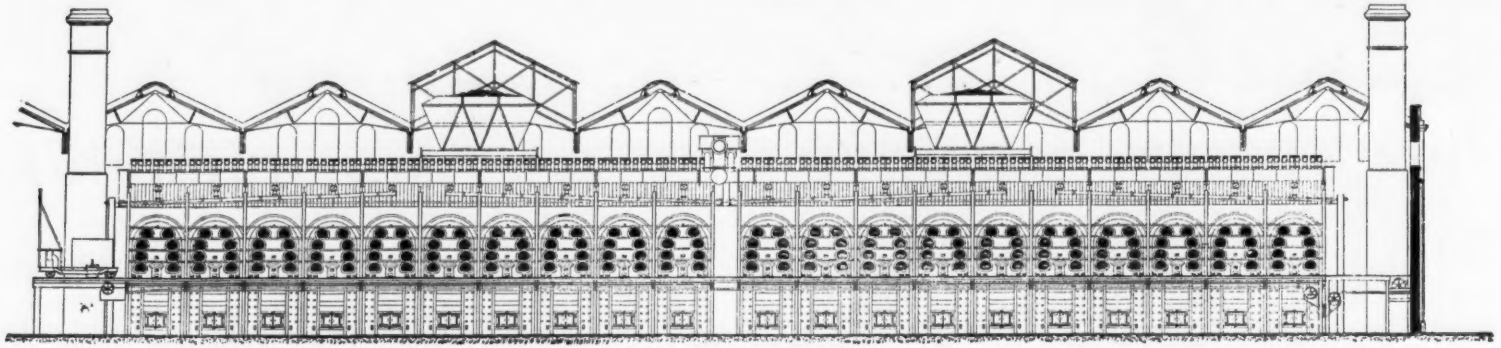
We in Australia, situated so far away from the field of active development, take a keen interest in the reports of the various installations and improvements which occur week by week in our Technical Press. But we naturally find it difficult to decide what form of carbonizing plant to adopt when designing extensions. In carrying out the work of reconstructing our retort-house at South Melbourne two years ago, I had, of course, to choose only between two systems—inclined retorts, or horizontals worked by the latest type of machinery. The latter system was adopted; and as you will be inspecting the works this afternoon, I will venture to give you a short description of the new plant.

Our South Melbourne retort-house is 460 feet long by 120 feet broad, and contained originally four sections, each comprising ten beds of sevens, all direct fired; and the portion reconstructed was the northern half, which contained twenty beds. Drawings Nos. 1 and 2 show in cross-section the house as it was originally built, and the reconstructed portion as it now stands on the completion of the work. You will notice that the new retort-bench has not been built in the middle of the retort-house, being moved out of centre, and within 20 feet of the wall on the yard side; the arrangement being designed to simplify the removal of coke and ashes to the yard, and also to enable the coal-stores to be concentrated on one side of the retort-house. The new installation comprises twenty beds, each containing eight retorts, 21 in. by 15½ in., D section, and 20 feet long, in four tiers; the beds being built in one block. The main arches are 8 ft. 6 in. wide; and the regenerators are of a plain tile design, specially bonded to prevent short-circuiting.

Ascension-pipes (7 inches in diameter) are provided on the charging side only, an arrangement which facilitates the working of the house, in addition to saving large capital outlay. I cannot see any necessity for adopting ascension-pipes at both ends of a 20-feet retort, since there does not appear to be any necessity for them with an inclined retort, in which, of course, the gas has to make its way down hill. The only objection that one might advance against the use of single ascension-pipes is the possible desirability of having them of larger diameter than would be the case if two pipes were used—an arrangement often necessitating the main arch being slightly wider than would otherwise be the case, and so causing greater ground area to be occupied. The hydraulic mains—one to each setting—are of special section to facilitate the removal of tar, which is run off by the tar-main (placed with a sharp fall under the hydraulics) into the tar-towers. There are four of the latter, one to each five beds, and placed one



Charging Side.



Discharging Side.

FIG. 3.—ELEVATIONS OF RETORT-HOUSE.

at each end of the bench, and two in front of a specially wide pier between the tenth and eleventh beds. From the hydraulic mains the gas passes into the foul main; two of Cowan's retort-house governors being installed to regulate the exhaust.

The charging stage and wall dividing the coal-store from the retort-house proper are built of reinforced concrete, and the discharging stage of steel. On the charging side run the De Brouwer projector and the Jenkins-De Brouwer pusher for charging and discharging the retorts. You will notice from Drawing No. 3 that the charging machine is supplied with coal from two centrally-situated overhead hoppers; these being fed by elevators, the crushers for which are placed under the centre of the coal-store. A De Brouwer coke-conveyor removes the hot coke as it is discharged from the retorts; the conveyor being divided into two portions, one running longitudinally down the front of the bench, and emptying into a cross inclined conveyor, in which it is quenched, and which carries the coke out of the retort-house and deposits it in the yard. On the discharging side, also, is a machine embodying a travelling platform and coke chute; the latter being of a special design, with a movable bottom plate, which, when in position, allows the coke to be deflected into the furnaces, or when removed directs it into the conveyor.* This machine—comparatively speaking, a very small item in the whole installation—has proved to be one of those little points which go to make the equipment of a carbonizing plant complete. Besides saving labour, it facilitates to a marked degree the carrying out of the work in the retort-house, and also simplifies the actual labour the men have to perform. The whole of the machinery, including the coal crushers and elevators, stoking machines, coke-conveyor, and travelling platform, is driven by electricity, the power for which is developed in the power-house at the other end of the works. The generating plant consists of a 65 Kw. British Westinghouse dynamo, coupled direct to a 100 B.H.P. gas-engine, all in duplicate. Here I may, perhaps, say that I am thoroughly satisfied with the adoption of electricity for gas-works purposes, and am convinced that, as time goes on, this power will be very largely used for gas-works operations, since it should be possible to adopt it with advantage for nearly every purpose required.

I am pleased to inform you that the whole of the settings and main arches (with the exception of the retorts and the facing of the piers) are built of bricks of Victorian manufacture; being made at Darley, near Bacchus Marsh. It is gratifying to state that our faith in this local article is proving quite justified; all the combustion arches and other parts of the settings standing well. It is a matter for congratulation that such a good deposit of fire-clay exists in Victoria. Its characteristics are its freedom from iron and other impurities, its high content of silica, and its small shrinkage. As regards retorts, I believe that "sectional" ones, or what are sometimes popularly termed "brick" retorts, are preferable. We have one bed of sectional retorts made of Darley fire-clay on trial, with every indication of satisfaction; so there is considerable possibility of our being able to obtain all

* Further particulars (and photographs) of the plant here alluded to appeared in the "JOURNAL" for Nov. 2 last year, pp. 307-11, in the course of an article contributed to our columns by Mr. Hunt, entitled "Gas Practice in Australia."—ED. J.G.L.

our fire-clay requirements locally for the future. The installation, completed the middle of last year, cost £45,099, and, compared with the previous cost of manufacture with direct-fired settings and hydraulic stoking machinery, is earning 26 per cent. on the outlay.

METHODS OF WORKING.

With the advent of the projector type of charging machine and the pusher discharger, ready means have become available for working horizontal retorts in practically any way desired—either with light or heavy charges. Moreover, the development of the vertical retort has demonstrated the fact that it is possible to carbonize coal with very satisfactory results by filling up the retort and not providing any special space for the gas evolved to make its way to the ascension-pipe. In designing the installation which I have just briefly described to you, the desire in my mind was to obtain an arrangement which could be worked as simply as possible with eight-hour charges; and for the greater portion of the sixteen months that the plant has now been in action, we have worked on this system. This, I may add, has also been the method of working with the De Brouwer machinery at our West Melbourne works for over two years. The weight of the charge at South Melbourne has averaged 8¼ cwt., and I am satisfied that the results from eight-hour work and heavy charges are a considerable improvement compared with the old six-hour method. We are able to obtain 11,000 cubic feet of gas per ton of 15½-candle power with mixed Newcastle coal, and we are able to make nearly 11 cwt. of coke for sale. We work with a ¾-inch seal and 7-10ths exhaust on the hydraulic mains.

Last summer we were most anxious to experiment with heavier charges—allowing twelve hours to burn-off; but the opportunity of trying the innovation in such a way as to obtain reliable data as to the result has only offered itself within the last few months. During the past three months, however, we have been working on this system, but almost entirely with a variety of Maitland coals; and although the alteration has taken some time to adjust, I have been able to glean from it some of the possibilities of the best Maitland coals under what I may term "prolonged carbonization." Owing to the exigencies of our coal supply, I am only able to give you one really comparable result, and regret that I have no particulars as to the possibilities of Newcastle coal with twelve-hour charges. I fear, however, that, since the latter coal swells considerably in the retorts, it will not lend itself to twelve-hour work so well as the Maitland.

Working with the same coal in each case—a first-class Maitland, with one-third small—we obtained the following results:—

Duration of Charge.	Weight of Charge.	Coal per Charge per Foot Run of Retort.	Gas Made per Ton Corrected to 60° Fahr.	Illuminating Power Tested with 15-Hole Argand Burner at 5 Feet rate.	Calorific Power.
Hours.	Cwt.	Lbs.	Cub. Ft.	Candles.	B.Th.U. Net.
8	8¼	138·5	12,067	15·09	570
12	11½	126	12,500	15·03	579

My regret about these particular trials is that they did not last more than ten days in the first case, and nine days in the second; and my impression is that the yield with twelve-hour charges would be further increased as a result of continued experience in working. You will notice from the figures that the make per ton increased under the longer period of carbonization by 433 cubic feet; the candle power being practically the same, while the heating power also increased. This latter seems to me a highly important point, and would appear to indicate that, by keeping the charge longer in the retort, a greater amount of gas is made of a heating rather than of an illuminating value. The charges, however, did not average so much as I was anxious to obtain (12 cwt.), due to two causes—first the difficulty on the part of the attendant on the charging machine in accurately gauging the charging of the retort; and, secondly, the small section of the retort installed—this being, as I mentioned before, 20 feet long, of ⏢ section, 21 inches by 15½ inches. It is a point, however, on which we aim for improvement. Working with twelve-hour charges, the cost of production is reduced; and the quality of the coke made is undoubtedly improved. Under this method, a good Maitland coal can be made to coke very well indeed—yielding a coke of a harder, denser, and less friable nature than when carbonized in smaller charges, and undoubtedly superior to that produced when the coal is charged by hand or by any other method which lays it on the bottom of the retort. There is a great point, however, in crushing the coal uniformly small. The illuminating power of the gas produced was not very high; and on this point the prolonged system may possibly solve a difficulty which, I have heard stated, exists in some works when using Maitland coal—that is, the inability to keep the illuminating power down. Generally speaking, I may say my experience with longer charges confirms that obtained at home; and, further, I believe that twelve-hour work, or, at any rate, very heavy charges, must result in increased economy in manufacture and improved residuals, and will prove the best and most satisfactory way of carbonizing Maitland coal in horizontal retorts. Certain it is that the horizontal retort is not yet dead, and that great improvement is possible by simply changing our method of working. At the same time, however, I feel that at South Melbourne we are handicapped in adopting 12 cwt. charges, owing to the size of the retorts. I believe that to make either eight-hour or twelve-hour work thoroughly successful, a larger retort than we have installed is necessary; and if circumstances will allow it, a longer one also—such as Mr. S. Y. Shoubridge has adopted, and is so successfully working at the works of the South Suburban Gas Company in London.

There is every indication, in fact, that the smaller sections of retorts to which we have been so long accustomed, have seen their day, at any rate for works large enough to adopt machinery, and it should now be possible, with the latest knowledge at our command, to design installations of horizontal retorts capable of reducing manufacturing costs considerably below those resulting from plants in general use at the present time.

A few words more on the subject of Maitland coal. The sulphur contained is higher than in the Newcastle coals—about 1·17 per cent., compared with 0·87 per cent. in the latter. But I must draw attention to the fact that the volatile sulphur in the coal does not increase in anything like the same proportion. Consequently the cost of purification should not be greatly enhanced. On the subject of sulphur in coal, it is very necessary, in selecting Maitland coal for gas-making purposes, to see that none is obtained from the upper seam of the Greta measures. The coal in this seam contains a large quantity of "brassy tops," with a high percentage of sulphur, which, of course, not only brings up the cost of purification very considerably, but also renders the coal unsafe to store in large quantities.

COKE-CONVEYORS.

Of retort-house appliances, none has simplified the work of carbonizing more, or made the lot of the stokers easier, than the hot-coke conveyor; and in my opinion no better means can be provided for removing the coke. At our annual meeting in 1907, you, doubtless, recollect inspecting a De Brouwer conveyor, then recently installed in our retort-house at West Melbourne; and it may interest you to know that the expenditure on maintenance during the two years it has been in continuous use has only totalled £7 4s. 6d. A new chain and other renewals will soon be necessary, at a cost of several hundred pounds; but, nevertheless, the result is highly satisfactory. The modern retort-house—and I speak here of horizontal installations—can now be arranged, owing to the ingenious inventions at our command, on very simple lines; and the secret of its successful management is close supervision and constant inspection of all details.

CONDENSATION.

The condensation of gas has received particular attention of late, chiefly in regard to its effect on the naphthalene difficulty. You will recollect the highly interesting investigation and researches carried out by Dr. H. G. Colman at the instigation of the Committee appointed by the Southern District Association of Gas Engineers and Managers. The object of the inquiry was to endeavour to arrive at a system of condensation whereby sufficient quantities of the light oil vapours could be retained in the gas to carry the naphthalene along with them. In Melbourne, the naphthalene trouble has at times been severe; the number of stoppages from this cause being invariably greater in the summer time than in the winter months. This, I believe, is largely due to our inability to properly cool the gas before it enters upon the subsequent stages of purification. With the ordinary agents at our command, it is practically impossible to do this. This may be more readily understood when I remind you that the average daily temperature of the air during the summer is constantly over 80°; and the temperature of the available water supply 70° to 75°. These figures do not indicate the variations to which we are subjected; for, as you are well aware, we occasionally get a week in which the air temperature reaches well over 100° each day. A study of these local conditions led me to recommend a modification of our condensing arrangements; and I am pleased to say that the Board whom I have the honour to serve is installing, at one of our works, a special water-cooling plant, worked on the anhydrous ammonia system. This will enable us to cool all the water supplied to the water condensers to practically any required temperature. It is my intention to endeavour to arrange the working of the plant and the regulation of the condensers so as to cool the gas to the same temperature (within limits) all the year round. It is not proposed, of course, to cool the gas any more in the winter than has been done hitherto, but to endeavour to continue the winter temperature through the summer. In the whole process of gas-making no portion is varied during the year, with the exception of the condensation; and to my thinking, improved results should accrue by our being able to control this in the manner indicated. It is our intention also to supply this cool water to the washers and scrubbers during the summer months, hoping thereby to increase the amount of ammonia recovered. The plant is only just completed, and during the coming summer we shall make the first attempt to regulate the temperature on the lines mentioned. At some subsequent meeting, I hope to have the pleasure of laying the results before you.

AMMONIA RECOVERY.

In regard to ammonia, I should like to bring under your notice a thought which has occurred to me in regard to the many small works that exist in Victoria. You have doubtless noticed from the reports in recent technical journals that Mr. F. T. Eustace, in his Presidential Address to the Irish Association of Gas Engineers, states that it is possible for a works making such a small

amount of gas as 10 million feet per annum to profitably instal a sulphate of ammonia plant. Several gas-works in Victoria of that size, and even larger, are at present running all their ammonia to waste. The manufacture of sulphate is, of course, out of the question; but would it not be possible for these works to provide a suitable amount of storage accommodation for the liquor, and for the companies interested to combine and provide a small ammonia concentrating plant (which is neither expensive nor extensive), and which might be sent to a works as required to concentrate the liquor? A suitable condenser could be erected on the spot; and I take it that steam could always be obtained by hiring a portable boiler. Such a proposal perhaps does not come within the scope of our Association; but, at any rate, members might discuss the matter informally, and see what could be done. In these days of competition, a little additional revenue must always be acceptable; and I believe the concentrated ammonia could be readily disposed of.

RESIDUALS.

The market for residuals, which is always varying, has not of late given gas managers cause for complaint. But we naturally hope that the demand for tar will improve, on account of its increasing use for road purposes. It is gratifying for us to know that the general opinion of road engineers in America, Europe, and Australia is that tar is the best article for the purpose of improving roads and reducing the dust nuisance. In Melbourne, large quantities are employed annually; and I believe our City Council was one of the first Councils to realize its advantages. All the tar so used is first distilled; and here I venture to say, in regard to quality, that success depends on its being prepared in such a way that the resultant distillate is of a constant consistency—a point on which gas managers should be able to assist the road engineer. It is unfortunate that for road purposes the demand for tar necessarily only takes place in the summer. This means storing a large stock during the months of greatest make; and there must, of course, be a limit to the amount of storage accommodation provided on a gas-works.

QUALIFICATIONS OF GAS MANAGERS.

Before bringing this address to a close, you may possibly look to me to say something upon two important matters—namely, the qualification of gas managers, and the competition with the electric light. In regard to the first, so much has been said on various occasions by many who are better able than I am to discuss the matter, that I will not inflict upon you my views on this particular point. But I will venture to say this, that whatever training a man may have before entering upon the management of a works, unless he can command a shrewd amount of common sense or "nouce," as it is called, together with a certain amount of tact, he will be of little service to a company. Our every-day work and our contact with consumers of all temperaments demand the exercise of these two qualities more than anything else; and the man in charge of a small works, particularly, who is able to combine them with an ordinary amount of technical skill, will prove the most successful manager of such an undertaking.

ELECTRIC LIGHT COMPETITION.

A large amount of public lighting is now undertaken by the municipal authorities. As you are aware, all the streets of Melbourne are lighted by flame arc lamps, supplied with current from the City Council's own supply station. Other Victorian Municipalities are constantly talking about promoting electricity undertakings to provide current both for public and private lighting; and in the minds of those town councillors who cannot, or will not, appreciate proved facts, electricity is better than our own commodity. At the present time, two well-known municipalities are considering a joint scheme of electrification, and they recently circularized their ratepayers on the matter, asking if they would use electric light for domestic purposes if it could be supplied as cheaply as gas. The favourable replies were computed to represent a gas consumption of 856,000 cubic feet per month. Now, this quantity of gas, in a good inverted burner, should give a total illumination equal to 17,000,000 candles, and, taking gas at 5s. per 1000 cubic feet, would cost £214. To give the same illumination by means of metal filament lamps (allowing 1·3 watts per candle power), current would have to be charged at 2·3d. per unit to equal the cost of gas. If, however, carbon filament lamps were used—allowing an efficiency of 3·9 watts per candle power—the charge for current would need to be 0·77d. per unit. It is difficult to see, then, how the electric light proposal can possibly be further considered.

Apart from such an instance as this, municipalities who are contemplating electricity for their district might do well to make themselves thoroughly acquainted with the progress in Europe, and particularly the recent action of the City of London in regard to the matter of public lighting. A few months ago, this Corporation appointed a Special Committee to inquire into the street lighting, and to visit the principal cities of the Continent. As a result, the Committee have recommended the adoption of high-pressure incandescent gas-lamps with inverted burners for all future extensions; the second portion of the recommendation reading, "But where gas is impracticable, electricity, with open arc or flame arc lamps, should be installed." The Committee also reported the very interesting fact that the Berlin municipal authorities are spending £50,000 sterling per annum in installing high-pressure gas lighting in the various streets, in lieu of the existing gas and electric lamps. This expenditure has been going on now for over two years, and will last another five years, at the end of which time £350,000 will have been spent in providing efficient gas lighting in the public thoroughfares. Knowing how thoroughly the Germans go into technical matters, there need be no doubt that the Berlin authorities quite satisfied themselves that they were obtaining the best lighting service before embarking on this huge expenditure. Moreover, it is decided that in future incandescent gas lighting only will be used in Berlin. In view of all this, I feel that municipalities here, who have at heart the desire to save the ratepayers' pockets, and at the same time obtain the most efficient light for public thoroughfares, must adopt gas lighting.

To meet competition, however, strenuous and unremitting activity must be shown by the suppliers of gas; and it will be found advantageous to recommend only the best of burners and mantles. In this respect, we cannot but regard the amount of cheap material being sold to the public as very detrimental, by reason of its flimsiness, to the interests of gas. As regards mantles in particular, I am compelled to speak strongly about the unsatisfactory nature of the locally manufactured article. Judging from my experience during the few years I have had the pleasure of residing in Australia, a mantle of a uniform and reliable quality seems too much to expect. What we require is a strong mantle, having a lasting illuminating power, and manufactured in such a way as will ensure the supply being of constant quality month by month. Support of local industries is to be highly commended. But there is a limit to everything, including the annoyance and dissatisfaction caused by a state of affairs such as I have indicated; and if, in the interests of our industry, other means are adopted in order to ensure supplies of a reliable mantle for maintenance purposes, the Australian manufacturer will, surely, have only himself to blame.

Mr. S. E. Figgis (Ballarat) proposed a very hearty vote of thanks to Mr. Holmes Hunt for his most comprehensive and able address. He remarked that he had given them a lot of matter to think over and digest at their leisure.

Mr. G. Swinburne (Melbourne), in seconding, said the election of Mr. Hunt to the chair at the last annual meeting had been well justified by the contents of his able statement that day, as well as in other ways. They looked to Mr. Hunt for a great deal, as Engineer of the principal Gas Company in Victoria. He had there opportunities which very few men had of doing a great deal of experimenting; and he was delighted to think that they had a man at the head of the Metropolitan Gas Company's affairs who had a great deal of energy, considerable originality, and initiative. It was only by means of engineers who had opportunities of experimenting, that they could get to the bottom of the many difficulties with which they had to contend. Mr. Hunt had given them his experience as to the values of Newcastle and Maitland coals; and he had a great deal more information, no doubt, which he did not want to put into a public address, but which he would be willing to give members privately. The study of the naphthalene difficulty was of enormous interest in a hot climate; and his experiments in this direction should be of great value. He was very pleased with the way in which Mr. Hunt had tackled these problems; but he thought that he (Mr. Hunt) was quite right in saying, when touching on vertical retorts, that they were going to keep their horizontal retorts. As most of their works were run by what were termed "twenty-four-hours-a-day managers," they would have to keep their horizontal retorts probably for a long time. It would be the largest gas-works only that would have the benefit of revolutionizing things by using vertical retorts. He had to congratulate the President on the great pains he had taken and the success he had achieved in giving the Association such a vast amount of information. He was glad so many visitors were there to hear the address.

The motion was carried by acclamation.

The President, in acknowledging the compliment, said he thanked them very much indeed for their hearty vote. He could assure them he was only too pleased to do what he could for the benefit of the gas industry in Victoria. In reference to the question of experimenting and investigation work, he wanted to say this: Mr. Swinburne had spoken very kindly about his work; but he wished to acknowledge the ready help of his very able body of assistants at the various works. In connection with the investigations in regard to the Maitland coals, he mentioned particularly the two Analysts, Mr. Macintosh, of West Melbourne, and Mr. Bleauchae, of South Melbourne, who had done a lot of hard work while certain trials and tests were being carried out.

Papers and Discussions.

The papers, entitled "Gaseous Firing for Small Works" and "Two Valuable Adjuncts to a Carbonizing Plant," were then read by their respective authors, Mr. J. W. Bean (Wangaratta) and Mr. A. G. Ambrose (Bathurst, New South Wales); and the meeting then adjourned for luncheon at the invitation of the Metropolitan Gas Company.

In the afternoon a visit was paid to the South Melbourne works of the Metropolitan Gas Company for the special purpose of seeing the new carbonizing installation and other improvements recently carried out there. The party was shown over the works by the President and Mr. C. W. Howlett (Works Superintendent). The company were entertained at afternoon tea.

These latter proceedings will be noticed next week.

JUNIOR INSTITUTION OF ENGINEERS.

Engineering Truths.

The customary success attended the anniversary dinner of the Junior Institution of Engineers on Saturday, when the President (Engineer Vice-Admiral H. J. Oram, C.B.) was supported by a company of distinguished guests. Men identified with the gas industry that one met were the President of the Institution of Gas Engineers (Mr. James W. Helps), Mr. Sam. Cutler, jun., Mr. E. Cutler, Mr. W. T. Hogg, Assistant Manager of the Mitcham and Wimbledon Gas Company, and the Secretary of the Institution of Gas Engineers and of the Institution whose anniversary was being celebrated (Mr. W. T. Dunn). After dinner several toasts and a programme of excellent music combined to give considerable pleasure.

The speeches were excellent. They all, in view of the position of the President, had a strong tendency to marine engineering; but there was much in what was said that applied to engineering generally. In proposing "Engineering and National Defence," Dr. T. J. Macnamara, LL.D., M.P., Financial and Parliamentary Secretary to the Admiralty, warned that while this country would without doubt keep in the forefront in "physicalism," we had to reckon with scientific attainment, and in the products of such attainment we must try to excel. The same line of thought ran through the response of Sir William H. White, K.C.B., F.R.S. Fittingly in view of his retirement from active work, there was retrospect in his remarks. He traced the progress of engineering in his particular sphere, and during his time. It was a stately march of achievement that he brought to notice. The importance of each step forward is best seen by such a long-period review, as time after time "we have seen these things pass, and have hardly stopped to wonder at the marvel." Another point was the recognition of the immense obligation under which the individual engineer rests to other engineers. It is by the combination of their work that the greatest results are ever accomplished. But wonderful though their inventions may be, it is the man behind who operates the apparatus who controls the result. The force must always be the man, notwithstanding all that is done in providing the machines. Then Mr. James Swinburne, F.R.S., proposed "Steam-Turbine Propulsion;" and he dilated on the great influence that accuracy in modern engineering work had had upon efficiency. Mr. Summers Hunter, the President of the North-East Coast Institution of Engineers and Shipbuilders, replying, in the absence of the Hon. C. A. Parsons, enlarged upon the aim of mechanical engineers in getting greater work and economy out of the machine.

What he regarded as the toast of the evening—"The Junior Institution of Engineers"—was proposed by the Rt. Hon. Lord Pirrie, K.P., P.C. He dilated upon the advantages that junior engineers have in these days. He realizes this the more when he compares the position of things that obtained when he first entered the engineering world, and when each man had to go largely "on his own." He envied the junior engineers of to-day their opportunities. As an Irishman, he was pleased that the Institution were to visit Ireland in the coming summer; and if the members visited Belfast, his own firm would be pleased to show them what they had. Naturally, the invitation was heartily received; and it was more expressly acknowledged by the Chairman of the Institution (Mr. Geo. T. Bullock), in replying to the toast. He also referred to the work of the Institution, pointing out that one of its aims was to assist the members not only while studying, but in their practical work. Not only, too, did they work side by side with the technical colleges and other institutions, but they found for the members social advantages—claiming that this was an important factor for young men when they were commencing the serious part of life. During its 26 years of work the Institution had met with great success. Many of the members occupied important positions to-day, not only in this country, but across the sea; and they attributed much of their success to their association with the Institution. They were a progressive body; and they offered to junior engineers an opportunity of showing their worth. Progress was well maintained. The Institution now numbered over 1000 members, distributed over the whole globe.

SOCIETY OF ENGINEERS.

The First Ordinary Meeting of the new Society formed by the amalgamation of the Society of Engineers and the Civil and Mechanical Engineers' Society was held on Monday last week at Caxton Hall, Westminster. At the commencement, the meeting was presided over by Mr. E. J. Silcock, M.Inst.C.E., the last President of the Society of Engineers, and Mr. W. Noble Twelvetrees, M.I.Mech.E., the last President of the Civil and Mechanical Engineers' Society. Among the premiums awarded by the Council of the Society of Engineers for papers read during the past year were the President's gold medal to Dr. David Sommerville, for his paper entitled "Some Observations on the Chemistry and Bacteriology of Sewage Purification;" and the Nursey premium of books to Mr. E. R. Matthews, for his paper on "The Corrosion of Steel Reinforcement in Concrete." The premiums awarded by the Civil and Mechanical Engineers' Society included a premium of books and instruments to Mr. R. O. Wynne-Roberts, for his paper on "The Past, Present, and Future of the Organization of the Engineering Profession;" and a premium of books and instruments to Mr. H. Laurence Butler, for his paper on "Specifications for Engineering Works." Votes of thanks to the Presidents, carried by acclamation, brought this portion of the proceedings to a close.

The first President of the new Society—Mr. Diogo A. Symons, M.Inst.C.E., then delivered his Inaugural Address. After expressing his thanks for his election, he alluded to the internal affairs of the new Society—pointing out that since the amalgamation there were more than 700 members—and put in a plea for large attendances at the meetings. Referring to the examination which is to be the qualification for Fellowship, he said he believed its introduction would have the same beneficial effect as had been the case in the Institution of Civil Engineers. Proceeding to more general subjects, the President called attention to the value of workshop training to engineering students, whether they intended to take up the civil or the mechanical branch of the profession. He belonged to the civil branch; but he had often looked back with gratitude to the time he spent in the shops. Touching some of the branches of engineering work with which he was associated, the President referred to the question of water supply in foreign cities. In reference to ferro-concrete, so largely used at the present time, though it had in many instances proved economical and entirely satisfactory for constructional works, he considered that a large factor of safety should be allowed, and every care taken to ensure the use of the very best materials and workmanship. The other subjects dealt with were the disposal of sewage, the motor industry, aviation, and the education of young engineers.

A vote of thanks was accorded to the President for his address.

REINFORCED CONCRETE CONSTRUCTION IN WATER-WORKS ENGINEERING.

The Liverpool University Engineering Society had this subject under consideration at their meeting last month—in the form of a lecture by the President, Mr. H. J. F. Gourley, B.Eng.

According to a brief report of the proceedings in the current issue of "Ferro-Concrete," the lecturer, in opening, mentioned the chief characteristics of concrete, steel, and of the combination of the two materials, adding that reinforced concrete had been extensively used in America and on the Continent (particularly in France and Germany) for water-works for many years. In this country its use was quite a recent development. The attitude of the Local Government Board, in refusing to sanction loans for reasonable periods on ferro-concrete structures, had much to do with the slow progress which had been made. There was still some prejudice amongst engineers against its use, and this in spite of the fact that experimental and practical evidence proved that ferro-concrete was a most satisfactory and durable material. The theory of reinforced concrete design to-day was in a perfectly logical and definite state, and had been endorsed by eminent bodies of engineers, both in Europe and in America. The main requirements to be fulfilled by the component parts of the concrete and by the reinforcing metal were briefly outlined. The difference of opinion with reference to what might be termed "clean sand" was referred to; and it was pointed out that it was not so much that a little extraneous matter was objectionable as that the variation in the strength of the concrete due to variation in the quantity and character of the impurity was most undesirable, particularly in reinforced concrete work. The leading systems of reinforcement were then described and illustrated; the advantages claimed in each case being briefly enumerated. The numerous advantages possessed by ferro-concrete over brick, stone, concrete, and steel when employed in the construction of reservoirs, aqueducts, high-pressure mains and dams were detailed. The lecture was illustrated by a number of excellent lantern slides showing the actual application of reinforced concrete in water-works structures.

Cuprous Compounds of Ethylene and Carbon Monoxide.—In continuation of a previous investigation, MM. Manchot and Brandt have studied in the "Annalen" the action of ethylene on cuprous chloride; and according to an abstract of their article given in the current number of the "Journal of the Society of Chemical Industry," it is found to be analogous to that of carbon monoxide—a dissociable compound, in which one molecule of ethylene is combined with one molecule of cuprous chloride, being formed in the presence of water or certain other susbtances, such as ammonia and aniline. Under like conditions, however, the compound is much more strongly dissociated than the carbon monoxide compound; and in all cases—*i.e.*, in the presence of water, hydrochloric acid, or ammonia—the absorption of ethylene is found to decrease with an increase in the copper concentration. On adding hydrochloric acid to the aqueous solution of the compound, much of the ethylene is evolved. Experiments both with ethylene and with carbon monoxide show that a rise of temperature, at constant gas concentration, is accompanied by a shifting of the equilibrium in the sense of increased dissociation, as observed in similar cases. Applying the results of the investigation to the question of gas analysis, it is pointed out that ethylene must be removed from a gaseous mixture before the absorption of carbon monoxide by cuprous chloride.

THE CAUSES AND RANGES OF VARIATION IN CALORIMETRIC TESTS.

By Thomas Holgate, F.C.S., M.Inst.C.E.

(*Continued from p.* 356.)

Changes of Atmospheric Relative Humidity.

The calculations in the preceding article have all been upon the basis of complete saturation by moisture of the gas, air, and products of combustion; the details given taking into account each element of the case, and comparing it in a preliminary way with the rule of the Gas Referees, which makes no reference to atmospheric humidity. Doubtless both the gas and the products of combustion are saturated; thus it is necessary only to consider how far variations in the saturation of the air affect the results.

The percentage humidity of the air relative to saturation varies throughout the 24 hours and throughout the year, and is affected by general climatic as well as local conditions. It will perhaps be best to give definite data over certain periods, to see what is the magnitude of the meteorological deviation that must be taken into account in its effect on calorimeter readings. The following are returns for relative humidity from the Kew Observatory.

Table III.—*Percentages of Saturation at the Ruling Temperature*

Dates and Periods.	Maximum of the Day.		Minimum of the Day.		Average of the Day.
May 1 1909	88·0	2 a.m.	49·0	noon	71·0
,, 2 . . . . . ,,	92·0	4 ,,	50·0	4 p.m.	69·8
,, 3 . . . . . ,,	94·0	5 ,,	51·0	5 ,,	71·2
,, 4 . . . . . ,,	88·0	4 ,,	45·0	3 ,,	63·9
,, 5 . . . . . ,,	83·0	2 ,,	41·0	1 ,,	62·9
Mean of month of—					
May 1909	84·8	4 ,,	52·9	4 ,,	69·0
May 1886-1905	87·5	4 ,,	59·0	4 ,,	73·0
July 1 1909	81·0	4 ,,	61·0	5 ,,	74·0
,, 2 1909	90·0	3 ,,	57·0	2 ,,	76·2
Individual minimum of the month . July 20	..	..	43·0	5 ,,	..
Individual maximum ditto . . . . July 4	97·0	7 a.m.	..	..	..
Mean of month of—					
July 1909	87·4	4 ,,	64·2	5 p.m.	75·7
July 1886-1905	88·0	4 ,,	56·7	3 ,,	72·3

Table III. gives a maximum of 97 and a minimum of 41, and the records for longer periods than are here exhibited show that any return below 41 is very exceptional, while inland stations do not often record more than 97 per cent. Taking the monthly mean degree of humidity at every hour of the day as recorded at Greenwich for the year 1906, we find the highest to be November, 88 per cent.; the lowest April, 69 per cent.; and the yearly mean, 78 per cent. The lowest hour, 3 p.m., 64 per cent.; the highest hour, 4 a.m., 88 per cent. As to Scotland, it is on record that 73 per cent. is the lowest mean humidity that occurs during May, the driest month.

As already shown, so far as relative humidity is concerned, the problem with the sample of gas chosen is reduced to a comparison of 5·2 cubic feet of air of x per cent. saturation *versus* 3·61 cubic feet of products saturated. The question of temperature change as affecting humidity under conditions of saturation has already been discussed; so that in this paragraph temperature is assumed to be unchanged. It has been shown that where the air is saturated the air and gas take into the calorimeter 0·0274 cubic foot of water vapour more than the exit gases take out, and that in such a case the gross calorific value and the condensation figure would both be over-estimated to the extent of 1·45 B.Th.U.; leaving the net value unaffected by this aspect of the case.

If the above-mentioned air supply—the theoretical one—be exceeded, such excess will not, under this condition of saturated air, alter the effect just named, which appears to be the greatest error that can proceed from this cause in this direction. But in the opposite direction what is the greatest error to be expected? Suppose this to be due to a low value—namely, a 40 per cent. relative humidity of the atmosphere. Under these circumstances, the air would take in $0·09 \times 0·4 = 0·036$ cubic foot of moisture, while the exit gases would continue to take out 0·0623 cubic foot—a difference of 0·0263 cubic foot, producing an under-estimation of the gross value and of the condensation figure of $0·0263 \times 53$ B.Th.U. = 1·394 B.Th.U., again leaving the net value unaffected. The figures show further that at 69·3 per cent. relative humidity there would be no error.

This humidity happens to coincide with the average of the monthly means for 1906 at Greenwich for the hours from 8 a.m. to 5 p.m., which was 69·3; the maximum being 80 and the minimum 64. The range of nine hours per day just given would often include the period within which calorimeter tests are made, but not necessarily always so; and therefore in this inquiry attention must be paid to the extremes possible as well as to the mean values. The highest relative humidity of the atmosphere is about 4 a.m., gradually falling to 8 a.m.; when it drops perceptibly up to 4 p.m., then rises gradually to 4 a.m. The average of the day for May, 1909, when the particular sample of gas was produced and tested, was 69 per cent., so that an average series of tests in that month would have involved no error. In other words, individual tests would have erred either way to the extent of the departure of the actual humidity from this mean. The highest was about 94 and the lowest 41 per cent.; so that a range of 25 above or below the mean of 69 would appear to be all that seems likely to occur. Yet, to include the most improbable, a 33·3 per cent. humidity will be taken into account.

Table IV. shows that with the theoretical quantity of air 1·45 B.Th.U. may be *added to* the gross value and condensation figure, leaving the net value unaffected at one end of the series; and 1·72 B.Th.U. may be *taken from* the gross value and condensation figure, at the other end of the series—a range of 3·17 B.Th.U. as between full and one-third saturation.

Table IV.—*Effect of Humidity when the Theoretical Quantity of Air is Employed.*

Relative Humidity per Cent.	Moisture. In Air.	Moisture. In Exit Gases.	Moisture. Left in Calorimeter.	Increasing Gross and Condensation.	Moisture Taken Out of Calorimeter.	Decreasing Gross and Condensation Figures.
	Cub. Ft.	Cub. Ft.	Cub. Ft.	B.Th.U.	Cub. Ft.	B.Th.U.
100·0	0·0897	0·0623	0·0274	1·45	..	..
94·0	0·0844	0·0623	0·0221	1·17	..	..
79·6	0·0715	0·0623	0·0092	0·49	..	..
69·4	0·0623	0·0623	..	..	0·0000	0·00
44·0	0·0395	0·0623	..	..	0·0228	1·21
40·0	0·0359	0·0623	..	..	0·0264	1·40
33·3	0·0299	0·0623	..	..	0·0324	1·72

In practice, this ratio of air to gas is exceeded; but there seems no reason why it should go, in the case of the Boys calorimeter, beyond a margin of 50 per cent. The figures of Mr. Coste and Mr. Butterfield show that in some tests this ratio was almost reached. Taking this basis as an extreme, the following relationships arise: The 0·0898 cubic foot of water vapour in the air becomes 0·1347 cubic foot in the fully saturated air of 60° Fahr., yielding products which contain 0·0449 cubic foot of moisture more than before—a total of $0·0623 + 0·0449 = 0·1072$ cubic foot.

Table V.—*Effect of Humidity when (A) 50 per Cent. Excess and (B) 25 per Cent. Excess of Air is Employed.*

[A.—Air entering calorimeter in excess of theoretical need, 50 per cent.]

Relative Humidity.	Moisture. In Air.	Moisture. In Exit Gases.	Moisture. Left in Calorimeter.	Increasing Gross and Condensation.	Moisture Taken Out of Calorimeter.	Decreasing Gross and Condensation Figures.
	Cub. Ft.	Cub. Ft.	Cub. Ft.	B.Th.U.	Cub. Ft.	B.Th.U.
100·0	0·1347	0·1072	0·0275	1·45	..	..
94·0	0·1266	0·1072	0·0194	1·03	..	..
79·6	0·1072	0·1072	0·0000	0·00	0·000	0·00
69·4	0·0935	0·1072	..	..	0·0137	0·72
44·0	0·0592	0·1072	..	..	0·0480	2·54
40·0	0·0539	0·1072	..	..	0·0533	2·82
33·3	0·0449	0·1072	..	..	0·0623	3·30

[B.—Air entering calorimeter in excess of theoretical need, 25 per cent.]

100·0	0·1122	0·0847	0·0275	1·45	..	..
94·0	0·1055	0·0847	0·0207	1·10	..	..
79·6	0·0893	0·0847	0·0046	0·24	..	..
75·5	0·0847	0·0847	0·0000	0·00	0·00	0·00
69·4	0·0779	0·0847	..	..	0·0068	0·36
44·0	0·0494	0·0847	..	..	0·0353	1·87
40·0	0·0449	0 0847	..	..	0·0398	2·11
33·3	0·0374	0·0847	..	..	0·0473	2·51

Table V. shows that when 25 per cent. excess of air is furnished there is no error when the relative humidity is 75·5 per cent., and when 50 per cent. of excess air is passed through there is again no error when the relative humidity is 79·6 per cent. Thus with a rise in relative humidity, a rise in the rate of air supply tends to counteract the error. Tables IV. and V. show that the error in one direction remains unchanged—viz., 1·45 B.Th.U.; but in the other direction it increases from 1·72 to 2·51 and 3·30 B.Th.U. when the air supply is in excess 25 and 50 per cent. respectively. The range of variation possible thus becomes 3·17, 3·96, and 4·75 B.Th.U. respectively.

Table VI. shows the relationship of the rate of air supply to the relative humidity which secures freedom from error.

Table VI.

Percentage of Excess of Air.	Relative Humidity Corresponding to no Error.
0	69·4
12·5	72·8
25·0	75·5
37·5	77·7
40·0	78·0
50·0	79·6

It is worthy of note as to humidity that the average at Greenwich for each hour of 1906 was 78, while for the same period for the nine hours each day, from 8 a.m. to 5 p.m., it was 69·3 per cent.

Having ascertained the magnitude of the several disturbing factors, it now remains to be seen how a combination of these may compare with the correction which is applied by those who work according to the instructions of the Gas Referees.

Tables VII. and VIII. show that the factors at work are diversified in their effect, and that the rule for correction adopted by the Gas Referees leaves untouched the observational errors as they affect the condensation figure. As their correction applied to the gross value also includes radiation, and to that extent must differ from the results that are here set forth, it is apparent that it is incomplete, by reason of its ignoring the atmospheric humidity. It is noteworthy that for the three examples worked out in Tables VII. and VIII. the maximum error as to the net value is ± 0·127 Cal. for each degree difference between the inlet and outlet gases, and this concurrently with its irregular distribution in the gross value and the condensation figure. It would appear that a final record of 1·39 Cal. too low in the net value is one calling for attention where accuracy is required. Any modification of the system of correcting should evidently take into account the factors that are in operation within the instrument, and apply a specific correction for each of them.

Probably they would need to be somewhat of the following nature:—

1.—The correction for sensible heat, per degree cent., to be 0·051 Cal. when 25 per cent. of air in excess is employed, and 0·0623 Cal. where 50 per cent. excess obtains; and it should be confined to the gross value.

2.—The correction for change of moisture, which operates in the same direction as the preceding one, should be double that—viz., 0·1 Cal. and 0·12 Cal. respectively—and needs to be applied to both the gross and the condensation values.

3.—The change due to shrinkage of the products, approximating 0·363 Cal., applied to both the gross and condensation values.

4.—The change due to departure of the air from complete saturation, approximating (*a*) 0·012 Cal. for each 1 per cent. falling off, when the theoretical volume of air is passed through; (*b*) 0·015 Cal. when 25 per cent. excess is used; and (*c*) 0·018 when 50 per cent. excess air is passed through. Applied to both the gross and the condensation values.

5.—Changes due to radiation from the calorimeter.

It is obvious that the application of the necessary corrections, or even knowledge that they were negligible, would involve the determination of the relative humidity of the air and the composition of the waste gases.

Ascertaining Relative Humidity.—When air is relatively stagnant, it is a much more difficult thing to ascertain its humidity than when it is moving freely; and to provide for the former case, which usually applies to any room, a fan must be employed in conjunction with a dry-bulb and a wet-bulb thermometer, constituting essentially a Richard Assmann psychrometer. As an alternative, a gravimetric test of the atmospheric moisture may be made; and this, upon the authority of Mr. W. J. A. Butterfield,* can be carried out by a two minutes' absorption, with an error of not more than 1 per cent. of the moisture present.

It is clear, therefore, that where accurate calorimetric returns are desired, there is no valid objection, either as to time or complexity, in ascertaining the important factor of relative humidity. As most of the doubts in calorimetry are assembled in the condensation figure, as is shown by many published returns, it is surely desirable that a series of experiments of this kind should be made.

TABLE VII.—*Effect of Combination of Factors under Declared Conditions Compared with the Referees' Rule.*

—	Adding to the True Values in Calories.		Adding to the True Values in Calories.		Adding to or Taking from the True Values in Calories.		Remarks.
	Gross.	Condensation.	Gross.	Condensation.	Gross.	Condensation.	
Sensible heat	0·120	0·000	0·12	0·00	+0·19	+0·00	Exit gases leaving 3° C. below temperature of air entering. General result: Approximately 0·38 Calorie *too little* assigned as the net value of the gas.
Change of moisture	0·24	0·240	0·24	0·24	+0·24	+0·24	
Effect of change of volume of products and relative humidity	0·363	0·363	0·00	0·00	−0·83	−0·83	
Total or net disturbance	0·723	0·603	0·36	0·24	−0·40	−0·59	
Referees' rule deducts	0·500	0·000	0·50	0·00	0·50	0·00	
Leaving the record too high	0·223	0·603	..	0·24	..	..	
,, ,, ,, low	..	..	0·14	..	0·99	0·59	
Degree of air saturation	Fully. Theoretical.		69·4 per cent. Theoretical.		33·3 per cent. 50 p. c. excess.		
Rate of air supply							
—	Increasing or Reducing the True Values in Calories.		Reducing the True Values in Calories.		Reducing the True Values in Calories.		
	Gross.	Condensation.	Gross.	Condensation.	Gross.	Condensation.	
Sensible heat	0·120	0·000	0·12	0·00	0·19	0·00	Exit gases at 3° C. above temperature of air entering. General result: Approximately 0·38 Calorie *too much* assigned as the net value of the gas.
Change of moisture	0·24	0·240	0·24	0·24	0·24	0·24	
Effect of change of volume of products and relative humidity	−0·363	−0·363	0·00	0·00	0·83	0·83	
Total or net disturbance	−0·003	−0·123	0·36	0·24	1·26	1·07	
Referees' rule adds	0·500	0·000	0·50	0·00	0·50	0·00	
Leaving the record too high	0·503	0·123	0·14	..	..	..	
,, ,, ,, low	..	..	..	0·24	0·76	1·07	

TABLE VIII.—*Effect of Combination of Factors when Outlet Gases are 11° C. below Inlet.*

Description.	Adding to the True Value in Calories.		Adding to the True Value in Calories.		Deducting from or Adding to the True Value in Calories.		Deducting from or Adding to the True Value in Calories.		Adding to the True Value in Calories.	
	Gross.	Condensation.	Gross.	Condensation.	Gross.	Condensation.	Gross.	Condensation.	Gross.	Condensation.
Sensible heat	0·44	0·00	0·44	0·00	0·68	0·00	0·56	0·00	0·56	0 00
Change of moisture	0·88	0·88	0 88	0·88	0·88	0 88	0·88	0·88	0·88	0·88
Change of volume of products and relative humidity	0·363	0·363	0·00	0·00	−0·83	−0·83	−0·63	−0·63	0.00	0·00
Total deviation	1·683	1·243	1·32	0·88	0·73	0·05	0·81	0·25	1·44	0·88
Referees' rule deducts	1·833	0·000	1·833	0·00	1·833	0·00	1·833	0·00	1·833	0·00
Leaving the record too high	—	1·243	—	0·88	—	0·05	—	0 25	—	0·88
Leaving the record too low	0·150	—	0·513	—	1·103	—	1·023	—	0·393	—
Degree of saturation of air	Fully Theoretical.		69·4 per cent. Theoretical.		33·3 per cent. 50 per ct. excess.		33·3 per cent. 25 per ct. excess.		75·5 per cent. 25 p. ct. excess.	
Volume of air supply										
Leaving the net calorific value too low after the application of the Referees' rule	1·393		1·393		1·153		1·273		1·273	

	Gross.	Condensation.
Sensible heat	0·64	0·00
Change of moisture	0·88	0·88
Change of volume of products and relative humidity	0·00	0·00
Total deviation	1·52	0·88
Referees' rule deducts	1·833	0·00
Leaving the record too high	—	0·88
,, ,, ,, low	0·313	—
Degree of saturation of air	78 per cent.	
Volume of air supply	40 p. ct. excess.	
Leaving the net calorific value too low after the application of the Referees' rule	1·193	

COMPOSITION OF THE WASTE GASES.

In order to compute the degree of excess of air passing, it is sufficient to ascertain the carbonic acid by absorption with caustic alkali, the oxygen by absorption with alkaline solution of pyrogallic acid, and the nitrogen by difference. The sample may be taken from one of the holes on the circumference of the cover of the Boys calorimeter; and some idea of its probable volume composition may be seen by an inspection of Tables IX. and X.

* See "JOURNAL," Vol. CVI., p. 373.

TABLE IX.—*Effect on Composition of Exit Gases of Excess Air Supply.*

Experimentalist	(1) Butterfield	(2) Butterfield.	(3) Coste.	(4) Coste.
Rate of gas consumption per hour	5·00	5·00	4·60	4·60
CO_2 produced per cent. of original volume of gas . .	61·36	61·36	56·00	57·10
Carbon dioxide, per cent.. .	8·00	8·75	8·76	8·52
Oxygen ,, ,, . .	7·00	5·68	6·17	6·47
Nitrogen ,, ,, . .	85·00	85·57	85·07	85·01
Carbon dioxide } In cubic feet	0·613	0·613	0·560	0·571
Oxygen . . } per cubic ft.	0·537	0·398	0·395	0·433
Nitrogen . . } of gas burnt	6·517	5·998	5·444	5·696
Total exit gases in cubic feet .	7·668	7·010	6·399	6·700
Air to gas burnt.	8·250	7·600	6·900	7·200
Excess of air supply per cent.	44·890	33·300	37·500	40·100

With the first sample of Table IX. it was found that with 8·25 of air to 1 of gas the effluent gas contained 7 per cent. of oxygen, which by the writer's computation is equivalent to 44·89 per cent. of excess air supply. With the same gas, with diminished air supply—viz., 7·6—the effluent gases contained only 5·6 per cent. of oxygen, and there was no combustible matter present. The altered proportion of air was secured by closing one of the five holes on the calorimeter cover. It then amounted to 33 per cent. excess. Columns 1 and 2 have been calculated from Mr. Butterfield's experimental data; and columns 3 and 4 from those of Mr. Coste—the excess air in the last-named tests being 37·5 and 40 per cent., or an average of 38·8 per cent.

TABLE X.—*Effect on Exit Gases of Excess Air Supply.*

[Computed from an Analysis of Gas from the St. Helens Vertical Retorts.]

Carbon dioxide per cent. . .	10·62	6·94	8·474	7·63
Oxygen ,, ,, . .	0·00	7·64	4·660	6·30
Nitrogen ,, ,, . .	89·38	85·42	86·866	86·07
Carbon dioxide } In cubic feet	0·49	0·50	0·50	0·50
Oxygen . . } per cubic ft.	0·00	0·55	0·27	0·41
Nitrogen . . } of gas burnt	4·12	6·15	5·13	5·64
Total exit gases in cubic feet.	4·61	7·20	5·90	6·55
Air to gas burnt.	5·18	7·81	6·50	7·15
Excess of air supply per cent.	none	50·00	25·00	37·50

Note.—The quantity of moisture in the exit gases is not here stated, but is given in Sections III. to V. of Table I. (*ante*, p. 356).

Table X. shows how a rise in the air supply to the specific sample of gas affects the percentage composition of the products. The incidence of this factor in the corrections required for various rates has already been given; and from Tables IX. and X., it appears that about 37·5 per cent. excess may be looked for with the Boys instrument. Especially is this so when the gas burnt per hour is proportioned to its calorific value, as then, within the limits of the capacity of the instrument, it is to a certain extent self-adjusting.

(*To be continued.*)

American Gas Institute and the Pipe-Thread Question.

The volume of proceedings of the American Gas Institute for the past year which was noticed in the "JOURNAL" last week contains the report of the delegates of the Institute (Mr. A. G. Glasgow and Mr. Van der Willigen) to the second conference of the members of the Commission on the Unification of Pipe-Threads for Gas Appliances organized by the Société Technique du Gaz, held in Paris last June. The summary and conclusions of the report show that, with regard to the profile and taper of thread, the American Briggs system has been accepted; as to diameters, the 17 mm. size has been reduced to 16·5 mm., and the 60 mm. size to 59·5 mm., making them no longer interchangeable with ⅜-inch and 2-inch pipes respectively; and with respect to pitches, 2·30 mm. (11 threads per inch) has been decided upon for diameters from 33 to 114 mm. inclusive, thereby adopting the British standard instead of the American pitches of 11½ threads per inch from 1 inch to 2 inches, and 8 threads per inch from 2½ to 4 inches. The delegates recommend the conditional approval by the Institute of the pitches adopted at the conference, and the concentration of the entire American influence upon securing, as far as possible, diameters that will be interchangeable with the Briggs standards. In connection with this subject, it may be mentioned that Mr. J. W. Helps, the President of the Institution of Gas Engineers, represented that body at the conference; and his report appears in their "Transactions" for last year (p. 293), as reprinted from the "JOURNAL," Vol. CVI., p. 885.

"All the great public services partaking of the nature of a monopoly, such as water, lighting, and means of communication, should be in municipal hands," says Sir John Benn, the leader of the "Progressives." "Well," says the "Financial News," "the water supply of London is already under the control of a public body—the Water Board—with such results that London has over and over again wished it were possible to get rid of it, and to replace the old Water Companies in their control of the supply."

VISIT TO THE VOELKER MANTLE FACTORY

By the London and Southern District Junior Gas Association.

A pleasant and instructive afternoon was spent last Wednesday at the mantle works of the Voelker Lighting Corporation by those members of the London and Southern District Junior Gas Association who were fortunate enough to be able to take advantage of an invitation by the Directors to inspect the factory. Considering that the visit took place in mid-week (so that everything might be seen in full swing), the attendance was a very large one; the visitors numbering between fifty and sixty. To show so large a party as this over the works at one time was a big undertaking for the management; but owing to the excellent arrangements that had been made, the inspection was of a thorough character—each member having ample chance of seeing and appreciating every point of interest (and there were many) about the place. This end was accomplished primarily by the splitting up of the visitors into quite small parties, so that crowding was avoided and all could keep in close touch with the guides. On arrival, it must be mentioned, the visitors received a hearty welcome by Mr. C. E. Masterman (a Director), Mr. C. R. G. Bowden (Manager and Secretary), Mr. F. Barnes Grundy (Chemist and Works Manager), and Mr. W. E. Fisher (City Representative), by whom, and other members of the staff, they were subsequently taken in hand. Mr. T. D. Asten, the Chairman of the Company, was unfortunately away in the United States.

The works of the Voelker Lighting Corporation (which are in Garratt Lane, Wandsworth, S.W.) do not, on approach, present an imposing appearance; but entering them it is soon perceived that they are well adapted for the purpose to which they are put. The site on which they stand comprises some 2 or 3 acres; and the ranges of buildings in which the processes of manufacture are carried on are single storey ones, which is found to be an advantage in various ways. At the busiest season of the year, employment is found for some 500 hands—which will give some idea of the business that is carried on. Of course, much of the work is done by machinery; but nevertheless each mantle, in process of manufacture, passes through the hands of perhaps more than a dozen workpeople, practically all of whom are women and girls. The evenness and rapidity with which they carry out the various tasks allotted to them—in fact, the smoothness with which everything in the factory proceeds—is one of the first points that strike a visitor; while another is the cheerful and well-ordered appearance of the workers, which speaks well for their employers.

The vital importance of the incandescent mantle to the gas industry in the present day, must under any circumstances have rendered a visit to a factory of this kind of value to a body like the London and Southern District Junior Gas Association; but in the case of the Voelker works, it may fairly be said that an additional element of interest attached to the inspection on account of the product being an "All British" mantle. All sorts and sizes of mantles are made. Indeed, nowadays requirements vary so much that adding together all the different qualities, shapes, sizes, &c., turned out by the Company, the total would probably reach several hundreds. As already remarked, all these are British made right through. The ramie fibre which forms their base is obtained from Yorkshire; and from this stage the manufacturing operations are all carried on in the works. The first process of knitting the yarn into single or double woven "stockings" (according to the style of burner on which the mantle is intended to be used) is carried out by the aid of a large number of machines; and here, of course, no labour is required, beyond the supervision of the machines themselves. The next stage is an important one; consisting, as it does, of washing, purifying, and drying the fabric. Ramie resembles cotton in the matter of being cellulose; and it is necessary to get out all the dirt, grease, resins, and ash. What the Company aim at, of course, is to get a mantle fabric that burns completely away, and leaves simply the rare earths. For the washing, there are distilled daily on the works about 1000 gallons of water. After the final washing in weak acid, the fabric is placed in centrifugal driers; and then it is taken to the drying-room. Up to this point, the fabric is in long strips; and in the drying-room these strips are stretched over steam-coils. When thoroughly dry, the fabric is rolled up again, preparatory to being cut into the lengths required.

It is in some of the processes of manufacture subsequent to this that one sees long rooms filled with active-fingered workpeople. For instance, in the very next stage the cut lengths (for the better quality of mantles) have narrow bands of tulle—or what is really mosquito netting—sewn round the tops. Then the mantles are soaked in what is technically termed the lighting fluid. They are dipped by girls wearing rubber gloves into the thorium solution, and placed on a revolving band which passes them between two rollers. By this means all the surplus liquid is squeezed out; the impregnating material which is left being spread quite evenly over the fabric. Later on the mantle heads are treated with a chemical and aniline dye solution, for the purpose of toughening them, and so preventing the breaking away of the asbestos loop. The dye has, of course, nothing to do with the toughening process, and, in fact, comes out during the burning-off; but it serves the useful purpose of indicating infallibly whether the mantle-head has been covered with the hardening solution. The sewing-rooms—rapid machines and as

rapid girls—perform their part of the process; and at this stage, one pauses to admire the ingenuity of a machine which, on one movement, threads the waxed asbestos loop through the top of a mantle.

The mantle has by this time approached a stage at which the individual skill of the worker is an all-important factor—that is to say, it has to be shaped. For this purpose, it is taken to what is called the "seasoning room," so that the girl who is subsequently going to treat the mantle may first of all shape it. This shaping is done on a wooden model; and it is found that each girl is able to do her own shaping in the way best suited to her own seasoning. In fact, these parts of the process of manufacture depend so entirely on the personal element that really every girl has to see her own mantles through. When they have been shaped, the mantles are sent to one of the burning-off rooms, where all the ramie is removed, and only the chemicals—thorium and 1 per cent. of cerium—are left behind. This accomplished, they are returned to the girls who shape them, and are by them seasoned by means of gas at about 10 lbs. pressure. To season a mantle rightly, requires several years' practice on the part of the operator; and even after long training, it is not every girl who can do it properly. It is really skilled labour of quite a high order. The gas for these processes is taken from the mains of the Wandsworth and Putney Gas Company through a 1000-light meter by Messrs. Thomas Glover and Co.; and then the portion that is required to be under high pressure is compressed. There are separate burning-off and seasoning rooms for vertical and inverted mantles.

The final process is, of course, the collodionizing, by which the mantles are rendered fit for transport. They are then ready to be sent to the packing rooms. There is, however, one more point about the Voelker works that is worthy of notice, and that is the system of testing which has been adopted by Mr. Grundy. The rule is to take for this purpose samples of every girl's work; but no girl in the seasoning room knows which particular bar of mantles that she turns out is going to be tested. Each girl has a number; and Mr. Grundy goes round, puts labels on such bars of mantles as he may select; and they are taken to the testing-room. Particulars of these tests are entered in a register, so that a record is kept of exactly what happens to the work of each girl as it is tested.

At the conclusion of the inspection, the visitors were invited to partake of tea and other refreshments; and after ample practical appreciation of this hospitality had been manifested, there was a little speech-making appropriate to the occasion.

The PRESIDENT (Mr. W. J. Liberty) remarked upon the pleasure he felt at seeing so many juniors around him. The fact that so many members had turned out on an afternoon in the middle of the week fully justified the visit. They were delighted to be at the Voelker mantle works, not primarily because it was the Voelker mantle works, but because it was a mantle works; yet they were all glad to be at this particular mantle works, because there was so much to be seen there. It was about a quarter-of-a-century since Welsbach first applied the bunsen flame to make heat supply light; and soon afterwards, a German gentleman, hot from the works of Welsbach himself, came to the City of London and called at the Guildhall, with a request to be allowed to put up what he called a "stocking," to show what he could do at 1s. 3d. each. The "stocking" was a very fragile affair; and on the day after it was fixed, when he (the President) turned up at his desk over which the arrangement had been placed, he found a little heap of dust on his blotting-pad. That was the end of the first Welsbach mantle he knew of in the City. How things had altered since that time, they were all aware. When, however, the visit to the Voelker works at Wandsworth was arranged, he for one had no idea of their ramifications. He did not at all expect to see a factory of the magnitude of that which they had just inspected. They were under a deep debt of gratitude to the Company for giving them permission to visit the works, and to the gentlemen who had so completely placed themselves at the disposal of the members. The staff had given up to the Association time which could have been otherwise employed; and they had taken the members round in small parties so that nothing should be missed. When he mentioned that many of those present had come from outlying places in the Southern district, it would be understood how fully the privilege of visiting the works had been appreciated. They had seen the process of manufacture from first to last—nothing had been hidden from them. They had inspected a mantle works where they really made a British mantle; and in view of what the firm had proved themselves able to accomplish, he felt confident that there was a great future in store for the Company. They all heartily wished success to the undertaking, because it was a British works.

Mr. F. AINSWORTH (Ilford), proposing a cordial vote of thanks to the Voelker Company, remarked that everything possible had been done to enable the visitors to see all that there was to be seen about the works. Those who had acted the part of guides had taken pains to give the fullest possible explanation of each process and piece of apparatus. The manufacture of mantles seemed to be very complex, for he understood that each one passed through about fourteen hands on the works. It must be a boon to the neighbourhood to have a factory which employed so many people; and it could be easily seen that the workers were well treated. It appeared strange, while the gas industry was talking about a pressure of (say) 54 inches, to find that the seasoning of the mantles was carried out under a pressure of about 10 lbs. He would have thought this was almost impossible. It gave him the greatest pleasure to propose a hearty vote of thanks to the Company for the hospitality they had extended to the Association, and to the staff for their trouble in showing the members round.

Mr. STANLEY BEVINGTON (Croydon) seconded the vote, and said the works had been a very agreeable surprise to him. When he was leaving for Wandsworth, Mr. Helps said to him "Mind you learn something." Well, he thought he had certainly done so; and he believed that this was the case with all the other members as well.

Mr. T. F. CANNING (Ilford), in supporting the motion, said it had been most interesting to see the mantle go through all the stages of its manufacture; and the experience they had thus gained must be of assistance to all the members in connection with their daily work.

Mr. S. A. CARPENTER (Hon. Secretary) remarked that at the first glance a mantle seemed quite a simple thing; and no one who had not been over a factory such as this would realize how many processes had to be gone through in making it.

Mr. E. PILBROW said that he had had great pleasure in joining the Association in the visit; and he was glad to support the vote of thanks which had been proposed.

The vote having been carried by acclamation,

Mr. C. E. MASTERMAN (a member of the Board) said that in the absence of the Chairman, Mr. T. D. Asten, who had been called away suddenly to the United States, it fell to his lot to thank the members for the kind way in which they had acknowledged the little efforts that had been made to give them a hearty welcome. It had always been the policy of the Company to try and produce the best mantle; and they wished their reputation to rest upon this, and not upon the cutting of prices, or anything of that kind. They were anxious that their customers should know they could rely upon them to supply the very best article that they could, compatible with the difficulties of which the members had already gained some idea. They could not secure the best article were they not a united works, and were not all branches of the staff working with one aim and object in view. The members had expressed appreciation of the Company's methods; and he thought any success they might claim for the mantles which they turned out was due very largely to the facts he had mentioned. If it was a works divided against itself, he was sure their mantles would fall. It was a small Board—there were only three members—and they had worked harmoniously together for a considerable time. He believed he was the oldest Director; but the most hard-working one was Mr. Asten, who was ably seconded by Mr. Bowden. The members had seen the works; and he need not therefore say anything about Mr. Grundy, who (as the excellent condition of everything proved) received hearty support from the other members of the staff. It had been mentioned by the speakers that everything had been thrown open to the visitors. The Board thought the time had come when scientists knew how the mantle was produced. The principal trade secret now was—"Skill, care, and patience." If they had all these qualities, and exercised them to the utmost, they would turn out good work; and though occasionally small matters might crop up which the Company would not wish immediately to give away, still these constituted a very minor detail compared with the three essentials he had mentioned. The good treatment of the employees had been alluded to. Well, the Company could not secure good results from discontented workpeople; and their aim had been to make the conditions the best possible. The undertaking had gone through much litigation at the outset; and it had only been by patient perseverance that they had arrived at the point where they were doing a quiet, steady business. They wished the representatives of the gas industry to realize how mantles were made. The management did not mind honest criticism if anything slipped by them; but they took care that nothing slipped by them which an honest man might not send out to his customers. He thanked the President and the other speakers for the kind things which had been said; and trusted this would not be the last visit which the Association would pay to the factory of the Voelker Lighting Corporation.

The party then separated.

Southern District Association of Gas Engineers and Managers.—We learn from Mr. A. F. Browne, the Hon. Secretary, that the next general meeting of the Association will be held on Thursday, the 10th prox., at the Hotel Cecil, at four o'clock, when Mr. C. Stafford Ellery, of Bath, will read his Presidential Address, and Mr. James Paterson, of Redhill, will take over the duties of Honorary Secretary and Treasurer.

Recent Wills.—Alderman G. Awburn Allan, the Chairman of the Walker and Wallsend Union Gas Company, whose death, in his eightieth year, was recorded in the "JOURNAL" for the 11th ult., left £4076. Sir William Lloyd Wise, founder of the Chartered Institute of Patent Agents, who died on the 6th ult., at the age of 64, as mentioned in the "JOURNAL" shortly afterwards, left estate of the gross value of £36,522, of which the net personalty has been sworn at £25,118. Mr. Thomas Appleby, the Chairman of the Hartlepool Gas and Water Company, who died on the 20th of November last, left £116,954.

MIDLAND JUNIOR GAS ASSOCIATION.

A Meeting of the Association was held on Saturday afternoon at the City of Birmingham Technical School—the PRESIDENT (Mr. A. O. Jones, of West Bromwich) in the chair. It had originally been arranged that two papers should be read; but the author of one of them was unable to fulfil his promise, in consequence of a change in his position. The only business before the meeting, therefore, was a paper by Mr. P. C. BALCON, of the Central Laboratory, Birmingham, on "Gas-Works Calorimetry." This, however, proved quite sufficient to occupy the time at disposal; for it was followed by a lengthy discussion, which had reference to some extent to details of the apparatus which the author described. Specimens of the various calorimeters were on view; and this, of course, lent an additional interest to the contribution. Further than this, at the conclusion of the paper, Mr. Balcon exhibited a series of lantern slides showing sections of the different instruments.

The PRESIDENT (after the minutes of the previous meeting had been read) expressed his regret that the second contribution had fallen through, and then called upon

Mr. P. C. BALCON (Birmingham), who read the following paper.

GAS-WORKS CALORIMETRY.

Apropos of the recent acceptance of a calorific value penalty clause by the Gaslight and Coke Company, to avert opposition by the London County Council to their Bill in the last session of Parliament, I might point out that, while the illuminating power of the gas supplied by a large undertaking varied during a long period as much as 20 per cent., the calorific value did not vary more than 7 per cent. It will be seen that the calorific value is practically constant; and that provided the illuminating power is kept within certain limits, there is no necessity to take special measures to maintain the calorific value steady, because it will remain so. I do not make the statement that calorific value is a function of illuminating power, or that it varies as the illuminating power varies. But I do say that, provided you are dealing with gas of fairly constant composition, it is possible to maintain a fairly constant calorific value, provided you see that the illuminating power is kept within reasonable limits. The limits which have been put in the Act of the Gaslight and Coke Company with regard to calorific value, give little cause for apprehension and for the outcry against the double penalty. If they keep their illuminating power at the limit of 14 candles and supply a mixture of coal and water gas with very little (if any) benzole enrichment, there should be no reason why a calorific value of 112·5 calories or 446 B.Th.U. should not be maintained. The introduction of the calorific value penalty is a step in the right direction for many reasons, and especially from the point of view of the chemist.

The calorific value test is an absolute measure of the gas value, and is not influenced by burner construction or physical outside influences, such as affect a gas-flame burning on a photometer. Provided the gas is completely burnt, and the calorimeter is properly constructed, there is no possibility of uncontrollable error creeping in. Then, again, the personal element is so much less likely to influence a calorimetric test than an illuminating power test; the personal work consisting only in reading two thermometers and reading a meter correctly.

In using the calorimeter as the measure for selling gas, none of the objections to illuminating power tests hold good. The calorimeter is practically automatic. Atmospheric conditions appear to affect the result scarcely at all, and the results can be expressed in absolute units.

After this short digression, I should like to describe a few of the instruments in use generally for the purposes of gas-works testing.

The first instrument is, of course, that prescribed by the Gas Referees for use in London, and the instrument upon which the gas supplied by the London Companies is tested. It was invented by Professor Boys for this special purpose. It makes use of the principle generally adopted in gas calorimeters—*i.e.*, heating a measured quantity of water with a measured quantity of gas, and noting the rise in temperature; the calorific value being obtained from the following formula:—

$$\text{C. V. in Cals. per cub. ft.} = \frac{\text{Diff. in temp.} \times \text{Wt. of water in kilos}}{\text{Volume of Gas.}}$$

$$\text{Cals.} \times 3{\cdot}968 = \text{B.Th.U. per cubic foot.}$$

The Boys calorimeter consists of three separate parts: (1) The base carrying the pair of burners and a regulating tap; the upper surface being covered by a bright metal plate and three centreing blocks which carry the body of the calorimeter. (2) A bright cylindrical vessel provided with a central copper chimney and a condensed water outlet. (3) The essential portion of the calorimeter, supported by the rim of the vessel (2), and attached to the wooden lid, which also carries the inflow and outflow arrangements and the thermometers.

Starting from the outflow end, we find a temperature equalizing chamber consisting of two dished plates of thin brass, held in place by three thin brass scrolls. The lower portion of this chamber is kept cool by the circulating water, the channel for which may be made in the solid metal on the right side, or may be a tube sweated-on on the left side. Connected to the water-channel at the lowest point, by a union, are five or six turns of copper pipe, such as are used in a motor-car radiator of the Clarkson type. On this, a helix of copper wire threaded by copper wire is wound, and the whole is sweated together by being immersed in a bath of molten solder. A second coil of pipe of similar construction surrounding the first is fastened to it at the lower end by a union. This terminates at the upper end in a block to which the inlet water-box and thermometer holder are secured by a union. An outlet water-box and thermometer holder are similarly fixed above the equalizing chamber. Between the inner and outer coils is placed an annular insulating brattice made of thin brass and containing cork dust. The upper space in this is closed by a wooden ring, and is inserted in molten resin to protect it from any drops of water which may condense upon it. This insulator is carried by an internal flange which rests upon the lower edge of the casting which forms the outlet-box. A cylindrical brass wall, a little smaller than the diameter of the containing vessel, is fastened to the lid, so that when the calorimeter is lifted out of the vessel, the coils are protected from injury. A regular supply of water is maintained by connecting one of the two outer pipes of the overflow funnel provided to the tap, and fastening the funnel about 1 metre above the apparatus. The other outer tube is connected to the apparatus through a short brass tube containing a diaphragm in which is a hole 2·3 mm. diameter. The flow of air to the burners is determined by the degree to which the passage is restricted at the inlet and outlet. The metal centring blocks are made of $\frac{3}{16}$th inch metal, to restrict the passage of air at the inlet. The holes in the lid, which determine the restriction at the outlet, are five in number, and $\frac{5}{8}$-inch diameter. The thermometer for taking the temperature of the outlet gases is fixed in a sixth hole. A glass vessel should be provided, containing a solution of sodium carbonate and the calorimeter after use should be lifted out and placed in this until again required for use.

This calorimeter gives extremely consistent results; but it requires to be used by an experienced person, or errors are liable to creep in. It also has a few constructional disadvantages; the most important being that it has luminous burners, thus precluding its use for rich gases. The others are merely mechanical, and can easily be overcome. For instance, it should be unnecessary to have to lift the whole body of the calorimeter off when lighting up. This may be of little moment in a testing-station similar to those in London, where the examiner has only one or two tests to make, and so lights up before placing the calorimeter in position; but where the operator has to perform as many as five or six tests on different gases, it becomes burdensome. Again, in my opinion it is a serious mistake to have the condensed-water drip in its present position; it being necessary to fill up to the level of this before commencing to test. The reason that this is disadvantageous is that the calorimeter, containing, as it does, a quantity of water just flush with the drip-pipe, must not in the slightest way be moved or disturbed during a test, as the smallest jerk may cause water to be bumped over into the receiver for condensed water, and so render the observation useless. It is also necessary with this calorimeter to take the condensation over a much longer period than is necessary for the actual test for gross value, as the water is delivered in a very jerky manner. The drip-pipe could easily be brought from the bottom of the vessel (which should also be given a slight slope), and so avoid the really unnecessary danger of spoiling a test by slightly disturbing the calorimeter.

An instrument which gives most accurate and consistent results, which can be used for any grade gas, and also which is probably more used than any other, is the Junkers apparatus. This calorimeter is probably the most useful of all the apparatus in present use for determining the calorific value of gases. The only alteration necessary to make in the instrument for use with gases of varied richness is in the injector-nipple. This is easily removed and replaced by one either larger or smaller, as required. Two nipples are supplied; and as the burner is an atmospheric burner giving complete combustion, there is a wide range of grade for each size; so that only when one comes to producer and such gases is it necessary to use a large nipple.

The apparatus is made in two forms—the standard type and the technical type. The standard apparatus consists of a combustion chamber formed by an annular copper vessel; the annular space being traversed by a number of copper tubes (about fifty), connecting the roof with the bottom of the chamber. The products of combustion pass through these tubes in a downward direction; while the water passes upwards outside them. The waste gases are thus cooled to the temperature of the inlet water, and pass away through a side conduit. The water which condenses in the apparatus falls to the bottom, and drains from a small tube into a measuring cylinder. The pressure of the water is kept constant by means of an overflow funnel; and the water leaving the apparatus has also to pass over a funnel, thus keeping always quite full. The rate of flow is adjustable by a quadrant cock (not, as in the Boys apparatus, by means of a permanent hole in a diaphragm); and it passes over the bulb of a thermometer just before entering the apparatus. The whole is jacketted with a bright plated copper jacket, to prevent loss by radiation. The technical apparatus differs from the standard type only in slight modification of constructional details; and these only tend to make the instrument more compact, and so more portable than the more elaborate type, while it is also slightly cheaper. The results it gives are very reliable, and are quite consistent. I have experience of a series of tests of a Junkers calorimeter of the technical type against a standard instrument; the difference in

the results being no more than 0·2 per cent. The newest form of Junkers calorimeter possesses the advantage of having the two thermometers at the same level, so that they can be more easily read.

Another apparatus much used in this country is the Simmance-Abady calorimeter. This is a very useful and cheap form of apparatus, which gives good results; my only quarrel with it being that it is too cheaply constructed. It depends upon the same principle as the apparatus already dealt with, but in place of the tubes, it has concentric annular copper vessels. The water flows upwards in the annular spaces, and the gases flow in the opposite direction outside them. The apparatus is carefully lagged with wood, to prevent radiation losses. An advantage which this instrument possesses over the older Junkers instruments is that the thermometers are placed at the same height; but, as already explained, the drawback referred to has been done away with in the latest form of Junkers calorimeter. This advantage, I might point out, is also shared by the Boys calorimeter.

May I now proceed to the actual test. Certain precautions are necessary to enable the results obtained to be properly comparative, and I might say reliable, and will do a great deal to increase the comfort of the operator. It is essential that the temperatures of the inlet and outlet water be maintained as nearly constant as possible, and also that the water supply should be as nearly as practicable independent of supplies which are liable to be suddenly started or stopped. Further, it is essential that it be maintained at a fairly equable temperature. This is best ensured by having a tank large enough to contain sufficient water for a number of tests, and placed at a convenient height to get a good head. It should, of course, not be supplied by an automatic arrangement, but should be filled up when the series of tests is completed, and so left until again required for use. The water will thus be able to attain a temperature near that of the atmosphere, and will also be at the same temperature throughout. It is quite easy, with the thermometer lenses supplied, to read the thermometers to 1-50th of a degree. This may appear to some to be an unnecessary refinement; but the test is so absolute that this gives additional accuracy at very little trouble, and so, of course, should not be disregarded. It is foolish to attempt to get reliable and consistent results with only a small quantity of water and gas used. If possible, at least 5 litres of water should be passed. Another refinement which should be employed, and which tends towards increased accuracy, is the graduation of the flask or vessel into which the water is delivered, to read grammes of water, and not cubic centimetres. The thermometer at the outlet should be read at least every half-minute during the test, and the inlet thermometer every minute, and the averages used in calculating the difference in temperature. The Gas Referees require a correction for the temperature of the gases leaving the instrument; but as in almost every case this is lower than atmospheric, it is not necessary for works' purposes. An excellent method of recording results is that adopted by Dr. Davidson at the Birmingham works, and which I give here.

Gas Tested. _____

Date. Hour. I.P. _____

Vol. = − at °F. and

Vol. at 60° and 30″ = × = (v)

Weight of Water Used (x) Kilos.	Volume of Condensed Water. (y) C.C.	Temperature Inlet. °C.	Temperature Outlet. °C.

$x \times d \div v =$ gross Calories

$= \times \div =$ (g)

$g - \frac{y \times 0{\cdot}6}{v}$ = net Calories

$= - \frac{\times\ 0{\cdot}6}{} =$ (n)

g × 3·968 = B.Th.U. gross.

n × 3·968 = B.Th.U. net.

Averages . . . .

Difference = _____ (d)

Initials _____

A number of attempts have been made within recent years to introduce recording calorimeters, the most successful of which are the Junkers and the Beasley.

The Junkers apparatus is one which records gross value and is similar in construction to the ordinary Junkers calorimeter. It is fitted with a regulating arrangement which consists of combined water and gas meter. As these two deliver constant quantities of gas and water, it is very easily seen that the rise in temperature is directly proportional to the calorific value. This rise is measured by a thermo-couple which actuates a needle and a pen. The gross value can thus be either read upon a galvanometer scale or recorded upon a chart. The apparatus is much used on the Continent.

The Beasley apparatus is an English attempt at recording calorimetry, and it does its work well. It consists essentially of a U tube communicating at both ends with reservoirs containing floats arranged differentially. The one limb of the U tube is formed by an annular vessel, in the central space of which is burnt the gas under record. The U tube is filled with an oil of fairly high specific gravity; and both the limbs are fitted with surface plates, to ensure perfect radiation, and so increase the sensitiveness of the instrument. The expansion of the oil in the warm limb is used to measure the heat value of the gas. The oil expanding raises the float in its own particular reservoir, and so causes the needle attached to the differential shaft to make a movement. The pen is attached to the lower end of the needle, and a clockwork arrangement is used to move a chart under the pen. It was found difficult at the commencement to make a perfect governor to regulate the supply of gas and keep it perfectly constant; but an ingenious arrangement has been adopted which effectually overcomes this. A meter is used in conjunction with a pendulum escapement; and the shaft is connected to the clock attachment by means of a fairly large watch spring, to prevent the meter being pulled up by the jerk of the pendulum. This, combined with a small anti-fluctuator of the gas-bag type, has been found to effectually regulate the gas supply.

Of course, the difficulty with all recording instruments of this type is that they do not correct themselves for temperature and barometric pressure. But a correction table is easily worked out and the necessary corrections applied to the indicated reading. Where calorific value is of importance—as it now is wherever gas is made and supplied—an instrument of this type is invaluable, as it enables an eye to be constantly kept upon the quality of the make. This is of importance in these days of large makes; and it also enables us to sail much nearer the mark than would be possible if only assisted by laboratory tests. This apparatus for all time disposes of the worry of keeping a continuous watch upon the various plants which go to make the gas supply of our towns; and incidentally I might point out that it disposes of that old nuisance the jet photometer.

Before leaving the calorimetry of gases, I might refer to the effect of the diluent gas carbonic acid upon calorific value and illuminating power. While 1 per cent. of carbonic acid has a deleterious influence of 3½ per cent. upon illuminating power, it has only an effect of 1 per cent. upon calorific value—a fact which, while very obvious, is still of the utmost importance. Another fact which is of interest and importance is that, while above a certain make the illuminating power of coal gas drops very rapidly, its calorific value drops but slowly; and the inference from this requires no dilation on my part.

Another branch of calorimetry which is, I am sorry to say, much neglected in gas-works, is the calorimetry of fuel. The increasing competition of coking-ovens and carbonization in bulk compels us to look upon our coke no longer as only a residual, but as an important branch of our industry; and to properly appreciate our coke, we must know its steam-raising and its general calorific power. A number of appliances have been designed for this purpose; and among these the earliest are our old friends the Thomson and Lewis Thompson calorimeters. These instruments, while being all right in their way, could only produce results which were, to say the least, comparative. But an instrument which is absolute was not used until within comparatively recent years. It is only possible to obtain accurate results with a calorimeter of the bomb type.

A splendid instrument is that designed by Berthelot and Mahler, and modified by Dr. Kroeker. The combustion portion of the apparatus consists of a nickel plated steel bomb, which has a lid to screw firmly on, and has a capacity of about 300 c.c. The lid is strengthened in the centre with a bridge, through which pass the entrance and exit gas-channels, both of which are closed by screw needle-valves. One of the channels is continued with a platinum tube right into the vessel, and is used for the introduction of oxygen. The joint is made tight by means of a lead washer. The lid and platinum tube also act as an electrode; the other electrode being introduced through the lid, and well insulated from it. A small platinum or clay crucible is used for containing the very finely powdered coke; and the fuse for igniting the coke consists of a very fine platinum wire, which just dips below its surface, and is connected to both the tube and the wire electrode. The bomb is filled with oxygen up to a pressure of 25 to 30 atmospheres, and is placed in a water-container, into which is introduced a weighed quantity of water. The whole is then placed in an insulating mantle—in this case consisting of a copper annular vessel containing water. The water-container is brightly nickel plated, and rests upon a vulcanite stand. A stirring arrangement is attached to the insulating vessel for keeping the water in the container constantly agitated; and a thermometer is used which is capable of being read to 1-50oth of a degree.

Discussion.

Mr. R. S. Ramsden (Burton-on-Trent) remarked that there was in the paper one point on which he was afraid he could not agree with the author. Mr. Balcon said the introduction of the calorific value penalty was a step in the right direction for many reasons. He himself thought it was not a step in the right direction unless at the same time that it was introduced the illuminating power test was done away with. They had, of course, to sell gas for lighting, heating, and motive power; and the competition they were subjected to from electricity and in some cases from oil and petrol gas plants for lighting, from coal for heating, and from electricity, steam, and producer gas plants for motive power, made it necessary for them to supply the gas that was best suited to the requirements of their customers, without anything in the nature of a penalty test. If, however, they were to have a penalty test at all, it should be of one kind only; and as the illuminating test was

now becoming obsolete, the calorific power test should meet the case. With regard to maintaining the water for the tests at the same temperature as the atmosphere, what sized storage tank would the author employ? Did he always use 5 litres of water for each test with the Junkers apparatus, or did he keep to the 2-litre measure?

Mr. C. C. BARBER (Birmingham) said the paper had come at a very opportune time, since the whole of the gas profession was interested in the suggestion of a parliamentary calorific standard being adopted in lieu of the illuminating power standard. A comparison between the methods of testing for calorific value and illuminating power was very useful, and showed how much more reliable the calorific test was than the illuminating power test. However, there were in the paper one or two statements with which at the present time he could not agree, and also a few matters which, in his opinion, required further explanation. The first point to which he desired to call attention was the Boys calorimeter. With luminous flames, it would appear that a certain amount of heat was wasted, either by incomplete combustion of the gases or by deposits of lamp-black on the apparatus. After the calorimeter had once been placed over the burners—unlike the Junkers or Simmance-Abady type—it was impossible to see how the flames were burning. Then the reading of the thermometers to 1-50th of a degree, certainly appeared to him to be an unnecessary refinement, since there were other errors that were liable to creep into the test which were more important. In the first place, it was seldom one met with thermometers that were generally used for gas-testing purposes which agreed to so fine a point as that. Next there was the question of the measurement of the volume of water passed through the calorimeter. Surely, to make the test accurate, this should be corrected to some standard temperature. He found from the Gas Referees' instructions for making the calorific test, that they considered that it was necessary to make a correction for the temperature of the effluent gases. In the instructions, the following statement appeared: "The difference in degrees centigrade of the temperature of the effluent gas and of the surrounding air shall be taken, and one-sixth of this difference shall be added to the result previously found if the effluent gas is the warmer of the two, or subtracted if the effluent gas is the cooler of the two. [This correction has been found by experiment.]" This, he would say, was far more important than the reading of the inlet and outlet thermometers to 1-50th of a degree. With regard to recording calorimeters, there was not the slightest doubt that they were exceedingly useful; but he could not agree with the statement that "this apparatus for all time disposes of the worry of keeping a continuous watch upon the various plants which go to make the gas supply of our towns, and disposes of that old nuisance the jet photometer." The recording calorimeter enabled one to keep a better watch upon the various plants, and thus ensure a more uniform quality of gas as regarded calorific value. But since, as was generally known, the illuminating power did not vary proportionately with the calorific value, the jet photometer could not be discarded until the illuminating power standard was done away with. If the atmospheric conditions were taken into account, then the jet photometer was a guide as to the illuminating value of the gas being made. Apart from the fact that recording calorimeters did not correct themselves for atmospheric conditions, there was the question of the amount of air that was passed to burn the gas. The flame was set so that it was just non-luminous. Supposing that during the course of gas making a richer quality of gas came along, then the flame would become partly luminous, and thus a portion of the heat would be wasted. In congratulating Mr. Balcon upon his paper, he would suggest that comparisons between illuminating power and the corresponding calorific value would have been useful; and perhaps the author would be able to oblige the members with some when replying to the discussion.

Mr. W. S. SMART (Saltley) voiced the indebtedness of the members to Mr. Balcon for having brought to the meeting so much apparatus for their inspection. Referring to the paper, he said, with regard to the test for calorific power, the author seemed to think that the outcry against this had been raised because of the difficulty of complying with it; for he stated that there should be no difficulty. So far, however, as he (the speaker) understood the matter, the outcry that had been raised against these tests was more on the question of principle. For this reason, the Birmingham Corporation recently successfully resisted the claim of the King's Norton Urban District Council to test the illuminating power of Birmingham gas supplied in their area; and he would fancy (of course, he spoke without authority) that, so far from welcoming a calorific test as "a step in the right direction," the Corporation would strenuously resist—and he hoped successfully—any endeavour on the part of the twelve or thirteen authorities in their area of supply to obtain the right to test the gas for calorific power. In connection with technical papers, the most extreme accuracy of expression was essential. This remark was called forth by the fourth paragraph of Mr. Balcon's paper, which opened with the words: "In using the calorimeter as the measure for selling gas." This was certainly liable to misconstruction on the part of those unacquainted with the subject. Such persons might think that their old and much-abused friend the meter had been superseded by the calorimeter as a measure for the sale of gas, instead of the latter being merely an instrument for testing quality. With reference to the suggested modification of the Boys calorimeter, in his opinion there would be a tendency for globules of condensed water to collect on the sloping bottom; and by this means, a certain amount of error would be introduced. The method adopted for recording results at Birmingham would have been more easily followed if a typical example had been worked out. The spaces left for the introduction of the figures in the equations in the form as printed were very small, and led to confusion. With reference to the calorific power tests for fuel, everyone would agree that they had been neglected; but he did not think the members would be unanimous in considering that laboratory tests were the best method of obtaining reliable information as to the steam-raising power of coke. It had been found out long ago that carbonization on a fairly large scale was the only reliable index to the value of coal for the production of gas; and test-plants of relatively large capacity had to be erected for this work. Such a course would be even more necessary in the case of a material of varying quality like coke. Practical boiler tests, which could be easily undertaken, would, in his opinion, be much better than laboratory experiments for ascertaining the calorific power of coke.

Mr. F. SHEWRING (Droitwich) said he noticed in the paper that 1 per cent. of carbonic acid reduced 16½-candle gas to 16 candles. This reminded one again of the question of lime and oxide purification. If the value was reduced so little by allowing carbonic acid to remain in the gas, he thought it was a good argument against the continued use of lime, which many works still clung to. The author referred to the personal element in taking photometric tests. He (the speaker) assumed that by this he implied that it was possible to make out the gas to be just what candle power was thought necessary. Surely, with an ordinary amount of practice, the results were to be relied upon. It appeared to him that the adoption of a calorific standard would not materially affect the manufacturer who distributed straight coal gas, because he rarely sent out gas of less than 14-candle power; but if water gas or some other diluent gases were mixed with it, the calorific standard would, in a sense, protect the consumer. He had seen a "Sarco" CO_2 recorder at work on furnace gases; and its operation was very satisfactory. It was a useful instrument where a large quantity of fuel was consumed.

Mr. H. E. STONE (Birmingham) agreed with Mr. Smart that the suggested improvement of the Boys calorimeter would introduce an error. He did not think the proposed method would be suitable for that instrument. He was rather sorry Mr. Balcon had not mentioned the effect of the different constituents of coal gas on the calorific value—methane, hydrogen, carbon monoxide, &c. This would have been extremely interesting.

Mr. L. J. HOYLES (Derby) asked whether Mr. Balcon had made any comparative tests of the same class of gas with the three different kinds of instrument. He thought the figures would be interesting.

Mr. W. H. JOHNS (Saltley) remarked that Mr. Balcon said: "The introduction of the calorific value penalty is a step in the right direction for many reasons, and especially from the point of view of the chemist." He would like to know the chemist's point of view. Personally, as the Superintendent of a works, it was his duty to make the gas; and speaking from his point of view, he thought they should not be bound down by two penalties—that was, the illuminating power penalty and the calorific value penalty. Let there be one or the other, but not both. One of the great advantages of using coal gas compared with producer gases was on account of its greater heating value; and therefore he did not think they should try to reduce the calorific power, but to retain it at over 500 B.Th.U. net. He had recently had a recording calorimeter fixed at his works; and he would have liked to have been able to give the members comparative figures. Owing, however, to the apparatus not having been at work sufficiently long, he could not do this. Personally he felt very much obliged to Mr. Balcon for bringing forward his paper at this time, when such a lot was being heard about calorimetry; but he hoped that the gas companies who were in Parliament would be successful—as he believed that one or two were last session—in resisting the insertion of clauses dealing with compulsory testing for calorific value where already testing for candle power was imposed by the authorities.

The PRESIDENT, in closing the discussion, remarked that the subject dealt with in the paper was one of increasing importance nowadays—especially as the idea was to make parliamentary stipulations as to what calorific power should be supplied. He was not in agreement with the member who proposed the keeping of the calorific power at a high figure. He thought that nowadays—especially when water gas was being made—the calorific power ought to be kept lower even than the figure mentioned in connection with the Gaslight and Coke Company. Carburetted water gas had a calorific power 10 or 15 per cent. less than coal gas for a given candle power; and, of course, blue water gas was even less. It might be their policy in future years to supply a lower grade gas, in order to keep their consumers. Of course, there was a big margin between coal gas at 500 or 600 B.Th.U. and power gas at 160 B.Th.U. He was sorry Mr. Balcon had not left the "beaten track" more than he had done, because it was the criticism of apparatus and the record of personal work that made such papers of value. He would have liked some figures in the matter of the relation of calorific value and illuminating power. Only recently it was stipulated that the Buenos Ayres Gas Company should supply 14½-candle gas with a calorific power of 539 B.Th.U. As a matter of fact, under ordinary conditions at present, coal gas of 14½-candle power would not have

such a calorific value. It showed how little was known of the matter that such a stipulation should be made.

Mr. JOHNS: I do not know whether I heard you correctly. Did you say the tendency was to supply gas of lower calorific value? Will the carburetted water-gas plant you have just installed at West Bromwich supply gas of a higher calorific value than the blue water-gas plant which you previously used?

The PRESIDENT: Yes.

Mr. JOHNS: Why are you converting your blue water-gas plant to a carburetted one, if the tendency is to supply gas of a lower calorific value?

The PRESIDENT: The reason is more a question of £ *s. d.* than of calories. In 1901, when blue water-gas plant was installed at West Bromwich, petroleum oil for making carburetted water gas cost 5d. or 6d. a gallon—a figure which prohibited its economical use for making gas. At present petroleum can be bought for 2¼d. per gallon, which renders it economical for making gas. Consequently we have installed a plant to manufacture carburetted water gas when desired; but it is arranged so that we can supply blue gas when the price of oil prohibits its use.

Mr. BALCON, in the course of his reply to the discussion, said Mr. Ramsden had expressed disagreement with the remark in the paper that "the introduction of the calorific value penalty is a step in the right direction for many reasons," unless at the same time the illuminating power test was done away with. Of course, to be saddled with two burdens would be rather an unusual thing to wish for, if it was possible only to be saddled with one. He did not advocate personally the use of two penalties. He said that, with the limits which had been put in the Act of the Gaslight and Coke Company with regard to calorific value, there was little cause for the outcry against the double penalty. There was no reason why a calorific value of 446 B.Th.U. should not be maintained with gas of 14-candle power. Mr. Ramsden seemed to deplore the fact that gas was tested at all. It was true that the electricity people were not subjected to tests; but he thought there was hardly any doubt of the necessity for a test with a commodity like gas. In the case of electricity, they measured energy, not something which could vary in composition; and a meter which was accurate showed exactly what was being purchased. With gas, it might be the case that a meter, though it measured accurately, did not give the consumer what he was expecting to buy. Hence the necessity for a penalty test. As to maintaining the water for the tests at the same temperature as the atmosphere, and the size of tank that should be employed, he might say they actually used 5 litres for each test; and the storage tank would be of a capacity to hold a sufficient number of 5 litres to make up the number of tests required, and a little bit over. Mr. Barber had referred to the flame in the Boys calorimeter, and expressed the opinion that, with luminous flames, a source of error might arise. He (Mr. Balcon) knew of a calorimeter which had been in use a long time, and the chimney was hardly blackened. The flames, of course, were very small; and they gave almost complete combustion. If the flames were too large, and touched the sides of the vessel, it might be that the apparatus would become blackened. Once the instrument was lit up and fixed, it was necessary to depend upon it to remain constant. In a number of the "JOURNAL OF GAS LIGHTING," there appeared some few weeks ago* a paper read by Mr. J. H. Coste before the Society of Chemical Industry, in which the author stated that he had made experiments with the Boys calorimeter, and had found that practically the whole of the gas was burnt, and that therefore the error due to imperfect combustion was negligible. But, of course, care must be taken not to let the flames touch the side of the vessel. Then Mr. Barber did not agree with reading thermometers to 1-50th of a degree. This, however, could be done without any extra trouble.

Mr. BARBER remarked that it was all right if the thermometers agreed; but he did not think he had ever come across a pair of thermometers in a calorimeter test that had agreed to 1-50th of a degree.

Mr. BALCON replied that he had a pair which agreed exactly.

Mr. BARBER said that, any way, if the author read his thermometers so accurately, he must get the other errors corrected if he could.

Mr. BALCON remarked that it resolved itself into a question of the time occupied in the test. To make a correction for the temperature of the effluent gases would involve extra expenditure of time; and, as he said in his paper, it was not necessary for works purposes. The thermometers could be accurately taken without any additional time being occupied. In the manufacture of coal gas, the recording calorimeter was invaluable, and disposed of a lot of worry which the variations of the jet might cause. With regard to a richer gas suddenly coming along and causing the flame to vary and alter the test, the change would have to be a very great one to affect the luminosity of the flame to a very small extent; and this would hardly affect the instrument. Such a change as would suddenly render the flame entirely luminous was not likely to be met with. With reference to Mr. Smart's remarks as to the claims of outlying authorities in the matter of testing gas, so long as it was the illuminating power test that was in question, he quite agreed with what had been said. It was understandable that passing gas through a long length of main would, in severe weather, result in a substantial drop in illuminating power; but in the case of the calorific value test, he did not see any such objection. The calorific value of the gas would not alter so much in passing through a long main. It would alter, there was no doubt, but not to anything like the same extent. This being so, he did not think there would be so much opposition to a calorific test, if it was properly interpreted. Then Mr. Smart quarrelled with laboratory tests of the calorific value of coke. Did he know of any other? The steam-raising qualities of coke depended, of course, upon its calorific value and the efficiency of the boilers. For selling coke, the calorific value test was a splendid comparative test. Certain cokes gave a certain calorific value; and their value for steam-raising purposes was directly proportional. As to Mr. Shewring's remarks, it certainly seemed that the introduction of the calorific value test would go a long way towards putting an end to the use of lime, where it was still employed. Of course, this was extremely expensive as a purifying agent; and if they could do without it altogether, so much the better. Mr. Stone did not like the suggested method of improving the Boys calorimeter; but he would no doubt admit that it was a difficulty to have to put so much water in the instrument.

Mr. STONE: I agree that it is very awkward, but you must not sacrifice the accuracy of the apparatus for the sake of saving yourself trouble.

Mr. BALCON: I do not see that you need interfere with the accuracy of the instrument by making the water drip from the bottom. Continuing, he said he was sorry not to be able to give any figures as to the effect of the different constituents of coal gas on the calorific value. He had not himself made any such tests; and so the only figures that he could have given would have been general ones obtained from various authorities. In answer to Mr. Hoyles, all the instruments had been tested against each other; and they agreed within reasonable limits. Replying to Mr. Johns, he might point out that the calorific power of gas was a thing about which there was no doubt. Alluding again to the Beasley calorimeter, he said it gave very consistent results, and agreed within reasonable limits with the actual laboratory tests. The President hoped that in time they might reduce the calorific value of the gas. Well, he (Mr. Balcon) hoped the day would be long coming when they would find it necessary to reduce the quality of the gas in calorific value. They knew it was easy to maintain gas at a fairly reasonable calorific value, as they had done it for many years. A matter of 530 B.Th.U. was easily maintained without any serious extra cost. But even the 450 B.Th.U. which the Gaslight and Coke Company had to supply at 14 candles, was really a high figure compared with producer gas. They were far and away in front of any other gas that was made for calorific value.

* See "JOURNAL," Vol. CVIII., p. 816.

Lectures on Smoke Prevention.

The first of a series of lectures which are intended to enlighten the public upon the evils of air contamination by smoke, was delivered in the High School, Glasgow, last Wednesday evening, by Mr. A. Wilson, the Gas Engineer to the Corporation. Bailie Paxton, the Sub-Convener of the Corporation Gas Committee, presided. Mr. Wilson's subject was "The Lighting and Heating of the Home." Dealing with coal gas, he mentioned that in Glasgow about 700,000 tons of coal were carbonized annually, producing a clean, smokeless fuel, which he contrasted with raw coal as used in ordinary coal-fires, in which at least 75 per cent. of the total heat generated by combustion of coal is lost in the form of flue heat, and from which solid and semi-gaseous impurities, equal to 5 per cent. of the weight of the coal burned, pass into the air to pollute it. This meant that for every ton of raw coal burned in an open grate, practically 1 cwt. of semi-solid impurities went into the air. The remedies he suggested were: (1) Coke specially prepared for domestic use, samples of which were shown, and regarding which Mr. Wilson said it was hoped that a supply would soon be available in Glasgow; but this remedy would only do away with the smoke, and would leave much of the dirt to be tackled. (2) Coal gas. The common objections to the general use of gas-fires were as unreasonable as objections to gas lighting from the hygienic point of view. It had been proved time and again that combustion in a properly constructed gas-fire is as perfect as in a good lighting burner. He made the suggestion that those who had not had experience with this type of heating should first try gas-fires in occasional rooms—stating his belief that a year's experience with gas-fires so used, and if properly attended to, would do more to convert economical housekeepers to the full use of gas as a heating agent than all the figures which could be put before them. Descriptions were given of the construction and working of apparatus for lighting and heating by gas, as well as practical illustrations of the use of gas; and numerous lantern views were shown. In the second of the series, held on Friday night, Professor J. W. Graham, of Dalton Hall, University of Manchester, said that he looked for the cure of house smoke to gas, to electricity, but especially to one of the new fuels such as coalite, which was made by extracting from coal, by high distillation at low temperature, the smoke hydrocarbons which the coal gave off first. In his opinion, every municipality should be urged to manufacture coalite or its equivalents, which should be saleable at about the price of coke. Pound for pound, coalite had 90 per cent., the value of coal; and it was clean, and, after the first few minutes, perfectly smokeless. It needed a free draught, and was probably not yet perfect. Gas at 1s. 6d. to 2s. per 1000 cubic feet could compete, even for all-day use, with coal.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

Visit to Messrs. Laidlaw and Son's Meter-Works.

The members of the Eastern District Division of the Scottish Junior Gas Association, to the number of thirty-five, visited last Saturday the meter-works of Messrs. R. Laidlaw and Son, Limited, Simon Square, Edinburgh. They were received by the Managing-Director (Mr. A. Young), Mr. G. Mills, Mr. A. Brown, and Mr. A. Thomson, representatives of the Company.

The walk round the works began with the foundry, and was continued through all the departments, till the one was reached in which the finished orders were being sent out. The making and fitting of the multitude of parts which are used in the construction of a meter were shown; the works having been kept running till after the visit, in order that this might be accomplished. Most of the power employed in the works is derived from gas-engines; and the whole of the lighting is by means of inverted incandescent gas-burners. The workshop is located in a building which is only a year or two old, in consequence of which, as might be expected, the working rooms are spacious and airy, and are well lighted; thereby making most comfortable the working conditions for the hands (numbering about 300).

Before the company left the premises, Mr. J. Rosie explained to them, and practically illustrated, the working of the apparatus for automatically lighting and extinguishing gas lights, of which he and Mr. James M'Kelvie, of Edinburgh, are joint patentees. The apparatus was described in the "JOURNAL" for the 14th of December last (p. 740). It was mentioned that the apparatus was used in connection with the lighting of the band-stand in the Exhibition in Edinburgh in 1908, and that during the whole of the season its action never failed.

After a pleasant drive, the company took tea together. Mr. A. Young presided, and said that, on behalf of Messrs. Laidlaw, he had had much pleasure in inviting the Association to inspect their works. He expressed the hope that what the members had seen would be for their instruction in regard to their particular business, and that it would also enable them, when they were questioned about gas-meters, to answer the inquiries put to them. He supposed most of the visitors had thought the works were not so large as they had found them to be. The prepayment meter business had given new life to the gas-meter trade. Last year their output of these meters was practically five times that of ordinary ones. Obtaining permission to visit works must be a great benefit to juniors. The more they could learn about the practical working of things relating to their business, the better it would be for them all. He hoped the Association would go on prosperously; and he was sure that manufacturers of apparatus would give them all the help they could in their striving for greater efficiency in their particular business.

The President (Mr. H. Rule, of Falkirk), speaking on behalf of the Association, thanked Mr. Young and his co-Directors for the pleasure they had given the members, and also for their hospitality. He likewise thanked the staff for the courtesy shown them. The works were in keeping with the progressive nature of the Company who owned them, and were equipped with machinery and apparatus with the object of turning out a sound and well-finished article such as they desired to have.

On behalf of the staff, Mr. G. Mills said what they had done for the visitors had given them very great pleasure.

A social hour was then spent; and at the close, on the motion of the Hon. Secretary (Mr. J. Dickson, of Kelty), a vote of thanks was given to Mr. Young for presiding.

Paris Gas Company's Electricity Station.

A recent number of the "Journal de l'Eclairage au Gaz et à l'Electricité" contained an illustrated description of the electricity station of the Paris Gas Company at their works at Le Landy (St. Denis). It was equipped by the French Thomson-Houston Company; and its object was the provision of the motive power required for driving all the coal and coke handling plant. The buildings consist of two machinery halls, each 74 feet long and 50 feet wide, and a central hall of similar length, but 80 feet wide. The latter contains the boilers, and forms a shelter for the conveyor. Each generating set consists of a compound tandem horizontal engine with two cylinders and a single crank, equal to 650 H.P., coupled direct to a 400-kilowatt continuous-current dynamo, arranged to keep up a pressure of 250 volts. Each boiler is of the multitubular type, and has a heating surface of 1571 square feet. It is combined with a steam superheater having a superficial area of about 160 square feet, and is equal to the production of 5500 to 6600 lbs. of steam per hour, at a pressure of about 170 lbs. per square inch at a temperature of 525° Fahr. At the rear of each boiler is an economizer consisting of 72 tubes. The normal speed of the set is 125 revolutions per minute.

In Trinity Hall, Bournemouth, a few days ago, Mr. Samuel Wood, F.C.A., gave an interesting lecture before the Bournemouth Natural Science Society, on "The Growth of the English Language"—a subject to which, as already mentioned in the "JOURNAL," he has devoted much study.

AN ELECTRIC GAS-METER.

Last December, Professor Carl C. Thomas, of Madison, Wisconsin, read a paper before the American Society of Mechanical Engineers, describing a meter the operation of which depends upon the principle of adding electrically a known quantity of heat to the gas, and determining the rate of flow by the rise in temperature of the gas, between the inlet and outlet of the meter.

A recent issue of the "Electrical Review" reprints the paper, from which it appears that the meter possesses the following characteristics: (*a*) There are no moving parts inside the meter or in contact with the gas. (*b*) The accuracy of the meter and its sensitiveness are independent of the rate of flow of the gas, and of fluctuations in pressure and temperature. (*c*) The meter may be used to measure gas at high pressure as well as at low pressure, and is independent of small fluctuations in pressure, such as those in the discharge from an air-compressor or in the suction of a gas-engine. (*d*) The meter produces a continuous autographic record showing the rate of flow and its variation. (*e*) Meters of comparatively very small size have very large capacities. (*f*) The meter may be opened for inspection, for blowing-out accumulated matter with an air-blast, or for washing with gasolene; and it can be dismantled to any extent desired, without interfering with the operation of the plant.

The meter consists of the measuring element, and a bye-pass through which the flow of gas can be diverted by means of valves. The measuring element consists of an electric heater disposed across the gas passage so as to impart heat uniformly and at a regular rate to the gas passing through the meter. The temperature of the gas on entering and leaving is measured and autographically recorded by means of two electrical resistance thermometers, one on either side of the heater.

These thermometers consist of wire wound on vertical tubes so disposed as to come into contact with all the gas passing through the meter, and substantially constructed. Diagrams are given in the paper, which show that every small fluctuation in the rate of flow is recorded. On one of them the variations are from 17,000 to 75,000 cubic feet per hour. A temperature difference of about 4° Fahr. gives a satisfactory record.

If heat is supplied uniformly and at a regular rate, then the difference in temperature will depend solely on the rate of flow of the gas—the smaller the flow, the greater the rise, and conversely. The speed of travel of the recorder paper may be altered.

The meter may be operated in two ways. In the first way the difference of temperature between the inlet and outlet is kept constant; and the watts required to maintain this constant difference of temperature vary directly as the rate of flow. The watts may be measured by a recording wattmeter or a watt-hour meter. The difference maintained is about 5° Fahr.; and this is kept constant by a device similar to that used in temperature recorders in connection with resistance thermometers. The variation of energy input is effected by a small motor-controlled rheostat on the switchboard. The second method allows the energy input to remain constant, and records the difference in temperature.

Of the two methods, the first is said to be superior, as it is independent of any change in the electrical resistance of the material composing the heater. The second method requires the maintenance of constant voltage, and constant resistance of the heater, or it becomes necessary to record both the energy input and the temperature difference. The meters can be arranged to operate with either continuous or alternating current; and the controlling device can be made to suit any voltage.

A test was made in which an electric gas-meter was compared with a newly calibrated wet meter, with satisfactory results.

The specific heat of a given kind of gas appears to be nearly constant, and a table was given in the paper showing the specific heat of illuminating gas and its various constituents. There was also a table referring to blast-furnace gas, the specific heat of which is almost identical with that of atmospheric air. The presence of ordinary amounts of water vapour has no effect on the accuracy of the meter, as the water does not undergo a change of state.

The quantity passing can be closely calculated from a knowledge of the energy input and the specific heat of the gas; and this affords an additional check on the meter's accuracy.

Professor Thomas has for some years been experimenting with reference to the determination of the specific heats of gases by heating them electrically; and the regular performance of a properly constructed heater led him to the idea that it might be used for the purpose indicated in the paper. The whole process of heating and temperature measurement is accomplished in a relatively small space, thermally insulated from the metallic walls of the meter.

The curve connecting the degrees rise in temperature per kilowatt introduced with the rate of flow takes the form of a rectangular hyperbola, asymptotic to the co-ordinate axes. The product, weight of gas multiplied by degrees rise per watt introduced, is a constant; and this constant, for a given kind of gas, takes the place of a calibration curve.

As the meter takes note of the quantity of the gas, and not only of the volume, changes in pressure do not affect its accuracy. The temperature of the incoming gas does not affect it, as it is the difference in temperature between the inlet and the outlet upon which the measurement depends. With gas-engines and

air-compressors, these features of the meter render it especially useful.

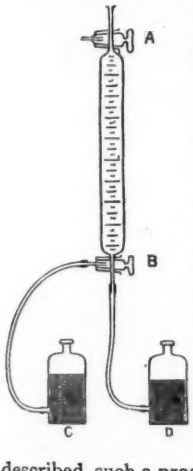
The temperature difference maintained can be altered to suit different rates of flow of gas. The electrical energy required is approximately 1 kw. per 50,000 cubic feet hourly capacity.

A modified form of the meter can be used for the measurement of steam, and also for determining its quality or the percentage of moisture in it. For quantity measurements, the steam is slightly superheated between the boilers and the meter. The measurement of superheated steam is simpler than is the case where superheat is not used. The amount of moisture in steam can be measured by passing all the steam through the meter and noting the amount of energy required to dry it and cause superheating to commence. Tests may be made by passing all the steam (which is, of course, the most accurate method) or only occasional samples, through the measuring element of the meter. The bye-pass may be used as in the case where the instrument is employed as a gas-meter.

The automatic recording device is so arranged that in the event of the flow of gas ceasing, the current is cut off at the switchboard. Further, if the flow becomes too small or too large for the making of a satisfactory record, the rheostat can be altered and the energy input decreased or increased as required. When a constant temperature difference is maintained, the rheostat is motor-controlled, and hand manipulation is unnecessary.

Simple Burette for Estimating Carbon Dioxide.

The current number of the "Chemical News" contains an illustrated description, by Mr. H. H. Stephenson, of a simple burette for the estimation of carbon dioxide in gas. It is a modified form of the Bunte burette, fitted with a three-way stopcock at each end. One way of the lower stopcock B is connected by a sufficiently long rubber tube to a bottle C containing water, and the other to D containing caustic soda solution of 1·28 sp. gr. To operate the burette C, the water-bottle is first raised till the burette is filled. The sample of gas, after running for a moment through the exit way of the upper stopcock A, is connected with the burette, and 100 c.c. of gas taken at barometric pressure in the usual way. The upper stopcock being closed, the water-bottle C is lowered till the water just appears in the burette above the bottom stopcock. The cock is turned to connect with the bottle containing the caustic soda solution, and the absorption of carbon dioxide promoted either by shaking the burette or by raising and lowering the bottle. The gas is then brought to barometric pressure, and the absorption read off. Before the next sample is taken, the burette should be allowed to drain off the caustic soda, or else be washed from the water-bottle, the contents of which must be frequently changed. In an Orsat apparatus, the water is often acidified and coloured red with methyl orange; but with the burette described, such a process might lead to the generation of carbon dioxide bubbles by the action of the acid on the carbonated soda solution. It is better to leave the water neutral, and colour the soda blue with litmus, so that its presence may be detected in the burette or the water-bottle. The burette can be used by workmen little trained to chemical manipulations.



For a long time past, Dr. Nogier, of Lyons, has been experimenting with the mercury vapour lamp, finding that the ultra-violet rays emitted from it are very powerful in destroying any bacteria that may be present in limpid liquids, especially water. He is reported to have succeeded in removing the most virulent germs from drinking water without altering its chemical composition. One minute's exposure to the rays of the lamp suffices for the process of sterilization. He has now perfected an automatic water sterilizer, consisting of an aluminium tube containing a mercury vapour lamp, and controlled by an electro-magnetic tap, which at once stops the flow of water should the lamp be put out of action. This method of sterilizing drinking water is claimed to be infinitely better—more certain, more scientifically perfect, and cheaper—than the electro-ozone process.

The first annual dinner of the Illuminating Engineering Society was held at the Criterion Restaurant, Piccadilly, last Thursday—Sir H. Trueman Wood presiding, in the absence, through indisposition, of Professor Silvanus P. Thompson. Among those who were present were Dr. Vernon Harcourt, F.R.S., and Dr. J. S. Haldane, F.R.S. (two of the Metropolitan Gas Referees); Mr. J. W. Helps, the President of the Institution of Gas Engineers; Mr. F. W. Goodenough, the Chief Inspector of the Gaslight and Coke Company; and Dr. R. Lessing. "Prosperity to the Illuminating Engineering Society" was proposed by Mr. A. P. Trotter; and "Kindred Societies," by Mr. Leon Gaster, the Hon. Secretary of the Society. Mr. Helps, in his remarks upon this toast, said the question of illumination required to be discussed independently of the interests of any particular luminant; and he wished the Society all prosperity in the good work it was doing.

REGISTER OF PATENTS.

Producing Ammonia from Peat.

WOLTERECK, H. C., and the SULPHATE OF AMMONIA COMPANY, LIMITED, of Fenchurch Street, E.C.

No. 27,905; Dec. 22, 1908.

In the process of producing ammonia from peat by moist combustion (as described in patent No. 16,504 of 1904), the patentees mention that "it is of the utmost importance to maintain the temperature of the reaction within a limited range." For this purpose, they proposed to employ varying quantities of steam or water vapour to check the tendency of the temperature to rise; and, in consequence of the use of rather wet peat in the process, the gases leaving the furnace or generator contain a very large amount of steam. It has already been proposed, they say, in the process of making ammonia from peat to return to the apparatus the gases which have been generated in the process and contain steam, after freeing them from ammonia.

According to their present invention, they dispense with the use of live steam nearly or altogether, by causing a part of the gases containing large quantities of steam, after the removal of ammonia and such other bye-products as it may be advantageous to remove, to enter the furnace or generator beneath the zone of reaction. The gases "mix with the air introduced for the purpose of the process, and greatly facilitate the maintenance of the temperature of reaction within the desired limits."

They carry out this modification of the process by withdrawing part of the hot gases after leaving the last scrubber or acid tower, as the case may be, by means of a fan or blower, and by conducting the same, by means of a pipe or pipes, or suitable duct, well protected against loss of heat, into the furnace or generator, as described.

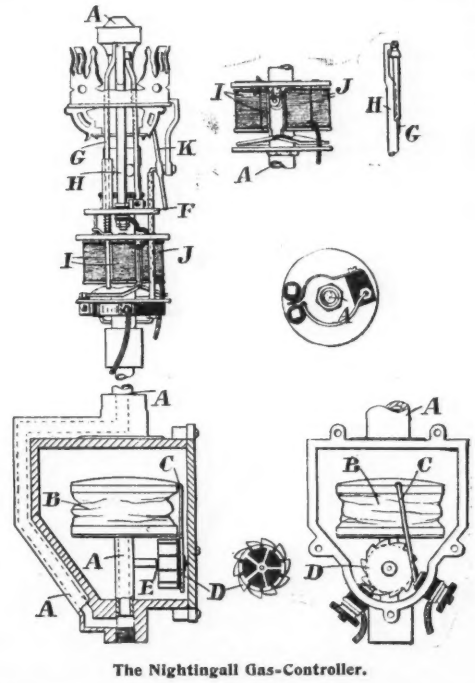
This arrangement is said to furnish not only the steam required by the process, practically free of cost, but it also assists to check the rise of temperature by means of the quantity of inert gases contained in the hot gases.

Lighting and Extinguishing Gas-Lights from a Distance.

BOUSFIELD, J. E. (a communication from the Nightingall Gas Control Company, Limited, of Melbourne, Australia).

No. 1264; Jan. 18, 1909.

This apparatus, for lighting and extinguishing street and other gas-lights from a distance, consists of an expanding governor, a thermostat, a capsule or other device actuated by temperature and operating a two-way switch.



The Nightingall Gas-Controller.

As shown, the gas supply pipe A is fitted with an expanding chamber B, the upper portion of which is weighted for the purpose of returning it to its normal position when the gas returns to its normal pressure. By adjusting the weights, the pressure at which the apparatus will operate can be determined. A swinging arm C depends from the moving part of the expanding chamber, and is bent inwardly at its lower end to engage with a notched or toothed wheel D, upon which is a commutator mounted at its centre upon a spindle E. A supporting platform F is mounted immediately under the burner, which is provided with a pilot-tube leading from the main supply pipe A.

A pair of contact pieces are arranged a little above the pilot-burner—one is a fixture, and the other is mounted upon a vertically sliding-rod G. The rod H is in electrical connection with a pair of electro magnets I depending from a support attached to the main gas-pipe a short distance below the platform F. The armature of the magnets bears against the

underside of the vertically sliding rod G, which is provided with a spring tending to return it to its normal position after it has been raised by the armature. Another pair of magnets J depend from the support carrying the magnets I. The armatures of the magnets are fitted with upwardly projecting arms—one adapted to open the gas-supply valve and the other to close it by bearing against a projection on the valve.

In its simplest form (where the lamp is merely required to be turned on and off by the alternate raising and lowering of pressure of the gas supply), the alternate segments are in electrical communication with the central spindle; so that each time the pressure is raised first one brush and then the other will be put in circuit—thus conveying the current to the turning-on magnets I and the turning-off magnets J alternately. In operation, when it is desired to light the lamp an extra pressure of gas is supplied so as to inflate the expanding chamber B. The swinging arm C lifts and revolves the commutator one notch, making contact with the battery. This action sends the electric current from the battery around the magnets I which attract the armature, whose upwardly projecting arm pushes the valve projection over to the opposite side and opens the valve, which allows gas to circulate through the burner and pilot-tube. Immediately the magnets I attract the armature, the latter pushes up the sliding-rod G, which carries the contact, and thus breaks the circuit. The spring then returns the sliding-rod, and the circuit is again completed. This make-and-break action is continued, and the sparks from the contacts light the pilot, which, in turn, lights the burner. After the gas has been burning a little time, it heats the expanding capsule or other heat-operated device K, which throws the switch over to the opposite terminal and stops the make-and-break ignition gear.

When it is desired to turn the light out, an extra pressure of gas is again supplied through the pipe A, so as to again inflate the expanding chamber B, the swinging arm of which, on rising, revolves the commutator the distance of another notch. This action brings an insulated section of the commutator opposite the brush, and puts it and the magnets J in electrical communication with the battery. This action sends an electric current around the magnets, thereby attracting the armature, whose projecting arm pushes the valve projection over to the other side, closes the valve, and thus turns off the gas supply. The current continues to flow through the magnets until the capsule K contracts owing to the absence of heat from the extinguished burner. This allows the two-way switch to again assume the original turning-on position in contact with the terminal of the wire leading to the turning-on magnets I. The parts are then in position ready to turn on and ignite the gas immediately the pressure has been raised so as to turn the commutator another notch.

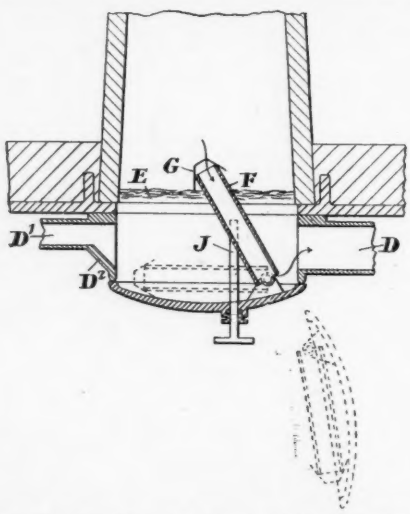
Vertical Gas-Retorts.

R. Dempster and Sons, Limited, Broadhead, J. W., and Toogood, H. J., of Elland.

No. 1484; Jan. 21, 1909.

This invention relates to vertical gas-retorts of the type in which the gas-outlets are placed in or near the bottom mouthpiece; the gas from the periphery of the charge thus passing downwards through the charge.

When using certain varieties of coal, the patentees point out that a layer of tar may, at a certain period of carbonization, be formed just below the heated zone of the retort, and on the surface of the coke or coke breeze usually fed into the mouthpiece before charging the retort with coal, and which layer of tar "would offer resistance to the downward flow of the gas." To obviate this, it has previously been proposed to employ a perforated pipe for conducting the gas from the coal above the tar layer to the outlet—a pipe capable of removal from the retort, as a fixed pipe would form an obstruction to the descent of the coke when discharging the retort, and has other disadvantages. The present invention has for its object the provision of means whereby the pipe can be withdrawn from the retort before discharging.



Broadhead and Toogood's Vertical-Retort Gas-Exit.

In the accompanying illustration (a sectional elevation of the lower end of a retort and parts connected with it), the lid C works on hinges (not shown) at the side which comes under the gas-outlet pipe D. An additional outlet pipe D^1 may be employed with an inclined part D^2, whereby any coke which may have lodged therein is allowed to fall out when the retort is discharged. E shows the tar layer; and F the pipe for conducting the gas from the charge above this tar layer. This pipe F may be perforated, and may be provided with a cap or deflector G to prevent entry of coal. The pipe F is pivoted to the lid, and raised, from the position shown in dotted lines to the position shown in full lines by the fork J, before charging.

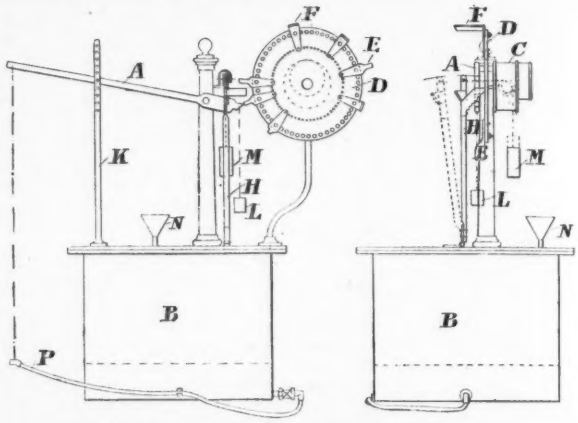
Instead of being arranged as illustrated, the pipe F may be so arranged as to be capable of being withdrawn into the gas-outlet pipe D before discharging the retort.

Pressure Changer for Gas-Governors.

Leigh, F., of Witney, Oxon.

No. 5242; March 4, 1909.

This is a method for automatically varying the load and pressure on a gas-governor by using a water-loading tank, with a stream of water continuously flowing into it, with special arrangements for regulating the height of water in the tank according to the pressure required at various hours of the day and night. It consists (as shown) of a copper tank mounted on the governor, into which tank a stream of water, regulated by a tap, is continuously falling. The outlet near the bottom of the tank consists of a short length of copper pipe, a tap, and a piece of flexible metallic tube fixed to it; and it is by the mechanical raising or lowering of the free end of this tube that the weight and depth of the water in the tank are controlled. The free end of the flexible tube is connected to a lever, working easily on a steel bearing. The lever is fixed so that five-sixths of its length is one side of the bearing, and one-sixth on the other—thus securing an intensified movement when the short portion is moved. A counterbalance weight is hung from the short end in such a manner that the long end, together with the flexible tube it supports, is slightly the heavier, and will remain at the lowest position at which it is allowed to fall, and if raised will fall again as soon as the raising force is removed.



Leigh's Automatic Pressure Changer for Gas Governors.

The lever is raised by tappets fixed on a dial, rotated once every 24 hours by a clock. The tappets are of different lengths; so that they disengage themselves from the lever at different positions as it is raised. Thus the lever may be raised only a small portion of its full range by one tappet, or it may be raised its full range by a longer tappet.

After the lever has been raised its required distance, it remains in that position until it is released by a catch, which, working on a hinge, is pulled by a weight working on a pulley over the lever, and engages one of a number of notches in the catch.

The lever is released as follows: The catch has fixed to itself at right angles, projecting towards the dial, an arm, which engages another series of tappets bent at right angles to the dial to which they are fixed. These tappets engage with the arm of the catch, and press it outwards away from the lever. This allows the lever to fall, and the flexible tube at its far end; thus discharging the superfluous water load. These disengaging tappets may be constructed to allow the lever to fall the whole distance or one or more notches at a time.

The clock-dial, which rotates in 24 hours, has 48 or 72 holes drilled near its edge, according as it is required that each hole shall represent 30 or 20 minutes of time. A similar number of holes to those drilled near the edge is also drilled between the edge and the centre of the dial. The tappets have a pin fixed at the end which points to the centre of the dial; the pin fitting into one of the inner holes. A bolt put through a slot cut in the tappet opposite the outer hole, in a line with the centre, fastens the tappet firmly to the dial with a nut.

In the accompanying illustration, N is the funnel through which water continuously falls into the tank B. P is a flexible overflow tube, connected at its discharge end to the lever A. K is the guide-rod. A pin inserted at one of the holes shown drilled through K determines the lowest position of the lever when released. L is the counterbalancing weight hung from the short end of the lever. H is the catch which engages with the lever and, by means of a notched arm, holds the lever in position. M is the weight attached to the catch, which, hanging on a cord working over a pulley, pulls the catch towards the lever. D is the dial rotating once every 24 hours. E is a tappet which depresses the short end of the lever and raises the flexible tube. F is a tappet which engages with the arm on the catch and by pressing it away from the lever allows the latter to fall.

Gas-Brackets.

Breeden and Co., Limited, of Birmingham.

No. 8632; April 10, 1909.

This invention relates to the joints of gas-brackets and other similar gas-fittings, and consists essentially in making in the top "square" of the joint a screwed hole for the reception directly of the inner screwed

end of the bracket arm, and in making the vertical gas-way in the tapering plug of the joint by drilling a hole through the top face of the "square" and through the end of the bracket arm therein. The upper end of the hole is screw-threaded, and combined therewith is a set or fixing screw, for firmly securing the inner end of the bracket arm in the "square." Where the bracket or fitting has two or more jointed arms, there is made in the bottom "square" and around the base of the screwed projection of the bottom "square" (on to which one of the arms is screwed) an annular groove or recess into which the extreme end of the arm fits.

APPLICATIONS FOR LETTERS PATENT.

2320.—Bone, W. A., Wilson, J. W., and M'Court, C. D., "Heating media." Jan. 31.
2345.—Best, R. H., and Williams, H., "Taps or cocks." Jan. 31.
2354.—Kerrill, H., Conyngham, F. E. S., and Moleyus, F. R. W. E. de, "Petrol gas." Jan. 31.
2356.—Ewart, J. W., "Water-heaters." Jan. 31.
2416.—Wilson, A. & L., "Manufacture of producer-gas." Jan. 31.
2426.—Baldwin, W. J., "Separating various materials from gases." Jan. 31.
2444.—Dunlop, J., "Gas-producers." Feb. 1.
2445.—Heather, C. M., "Gas-saver." Feb. 1.
2463.—Dudley, S., and Wilson, T. W., "Stands for supporting utensils to be heated by gas." Feb. 1.
2528.—Hirschhorn, J., "Regulator for bunsen burners." Feb. 1.
2675.—Wills, C. E., "Gas-stoves." Feb. 3.
2687.—Rees, W. B., "Pressure-reducing valve." Feb. 3.
2736.—Down, H. L., Havers, E. W., and Telephos, Ltd., "Igniting and extinguishing gas from a distance." Feb. 3.
2739 —Fairbrother, G. T., and Smith, N., "Carburetted air." Feb. 3.
2808.—Tourtel, J. M., and Stevens, J. H., "Incandescent burners." Feb. 4.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Flow of Gas Through Pipes.

Sir,—Mr. Carpenter will confer a benefit on the gas industry, no less than that conferred by his standard burner, in advancing the scientific treatment of a further problem, by the valuable experiments that Mr. Chandler has been making for him on this question (*ante*, p. 357); which experiments, like the knowledge gained by Mr. Helps at Nuneaton on his high-pressure main, demonstrate beyond contention the incompleteness of Dr. Pole's formulæ.

Two features of this formulæ have always been stumbling-blocks to myself, and, I suppose, to many others. First, they are based upon the behaviour of a fluid which is inelastic—viz., water—and, therefore, has a radical differentiation from a very elastic fluid of such very different weight as coal gas. Further, the formula for the flow round curves involves the anomaly that the complete rotation of a circle would give no greater resistance than that of a quarter circle. Both these points give one cause to pause. Unfortunately, the means of practical experimenting are not very commonly to hand.

It is idle to make any experiments except upon conditions which can be absolutely reproduced; and I hardly know of any suitable location for such experiments upon an important scale, except (say) the long, straight road between the Beckton Gas-Works and Canning Town, where probably some 2 or 3 miles of perfectly straight pipe could be installed with the necessary plant for testing the flows under different pressures. It is possible that the Governor of the Gaslight and Coke Company might grant some such facilities; and such experiments would be invaluable to the whole of the gas industry, which might contribute to the cost of making them.

It occurs to one that a further improvement in the experiment would be to have some resistance at the outlet of the pipe, instead of a free discharge into air, and that the pressure exhausted by the friction should be calculated as between the pressures at the origin and at the point of delivery.

So important have I always regarded this question that, in my year of presidency of the Institution of Gas Engineers, I sought the contribution of a lecture on it from Professor Unwin, which forms in their records a classic in gas literature.

In my practice many years back, owing to the difficulties arising from condensed obstruction, and from the indirectness of the courses necessary to be followed in most cases, I laid down a scale for the guidance of the staffs, giving calibres largely in excess of the Pole formula, and abolished altogether as uneconomical mains below 4-inch, and services below ¾-inch bore, which course further provided for the possibly extended demand arising with cheaper gas and a better knowledge of its fuel value.

Hy. E. Jones.

Palace Chambers, Westminster, S.W.,
Feb. 10, 1910.

Mr. Marwick's "Chemistry of Coal Gas" Paper.

Sir,—I shall feel obliged if you will allow me space to make the following corrections.

During the discussion on Mr. Marwick's paper, read before the Scottish Junior Gas Association, a report of which appeared in your last issue, I referred to the fact that chemical actions can be of two kinds—viz., exothermic and endothermic reactions—reactions in which the heating effect is either positive or negative. By way of illustrating this fact, I took as representing an endothermic reaction the equation, $C + H_2O = H_2 + CO$, but which has been misrepresented by your reporter.

I also drew attention to the fact that the interaction between carbon and oxygen can take place in two forms with the production of heat; and in stating the last equation a printer's error seems to have crept in, as 3 lbs. of carbon is given instead of 2 lbs., as per the following reaction

$$\left.\begin{matrix}2\,C + O = 2\,CO + 8000\ \text{B.Th U.} \\ 2\,CO + O = 2\,CO_2 + 21{,}000\ \text{B.Th.U.}\end{matrix}\right\} \begin{matrix}= 2\ \text{lbs. carbon} \\ \text{for 2 lbs. carbon.}\end{matrix}$$

In conclusion, I need hardly add that for the economical working of the regenerative setting, this reaction should be carried out in separate parts of the setting.

Peter MacDougall.

Helensburgh, Feb. 12, 1910.

LEGAL INTELLIGENCE.

THE VALUATION OF PREMISES FOR WATER SUPPLY.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Friday, Feb. 11.

(*Before Justices* Phillimore *and* Bucknill.)

Metropolitan Water Board v. Streeton.

This was an appeal by the plaintiffs from the decision of his Honour Judge Woodfall, at the Westminster County Court; and it raised the short point whether, in case of dispute, the annual value of premises has to be fixed by two Justices, or whether the valuation list of the Metropolis is binding. The case was noticed in the "Journal" for the 29th of June last (p. 983). The respondent, who is the owner of three houses in Rotherhithe, each rated to the poor at £19, was sued for 17 quarters' arrears of water-rates in respect of these houses; and he contended before the County Court Judge that the Water Board must prove by expert evidence that the "annual value" of the property was under £20. This the Board were unable to do; and the learned Judge nonsuited them. From this decision they now appealed.

Mr. Danckwerts, K.C. (Mr. A. B. Shaw with him) argued that "annual value" meant rateable value as ascertained by the assessment list, and that it was not necessary to get the value ascertained by two Justices.

Mr. Giveen represented the respondent.

Justice Phillimore, in giving judgment, said the action was to recover from the owner of certain premises 17 quarters' arrears of water-rate. In respect of four quarters, the defendant had paid the amount into Court; and as to the others the Board were content to waive their claim, though without prejudice to their rights in other cases. Section 68 of the Water-Works Clauses Act, 1847, provided that the water-rate should be paid by, and be recoverable from, the person requiring, receiving, or using the supply of water, and should be payable according to the annual value of the tenement supplied with water. If any dispute arose as to this value, it was to be determined by two Justices. Section 72 enacted that where the annual value did not exceed £10, the owner instead of the occupier of the premises was liable for the rate. For a very long time there was considerable doubt as to what was meant by "annual value;" but it was set at rest in 1883 by the decision of the House of Lords in the Dobbs case, in which it was laid down that "annual value" meant the value as declared by the Parochial Assessments Act (6 & 7 Wm. IV., cap. 96). After that case had been decided, the Water-Rate Definition Act (Torrens's Act) was passed; and it was now contended that this Act must not be taken as interfering with vested rights. The Act did not alter the valuation either for the purpose of the payment of the rate or for settling which of two persons was to pay. It only provided a natural and cheap mode of ascertaining what the value of the premises was, for the purpose of either section 68 or section 72 of the General Act. Torrens's Act provided that "annual value" should be the rateable value as settled from time to time by the local authorities. The cumbrous procedure under section 68 of the Act of 1847 of having the value settled by two Justices ceased to be operative; and for the purpose of making this clear, the Definition Act was passed. There was nothing in that Act which altered the rights of tenants and owners towards water companies. He was of opinion that in respect of the four quarters in dispute the Board were right in their contention; and the judgment of the County Court Judge must be varied in this respect.

Justice Bucknill concurred.

The appeal was therefore allowed, with costs; but leave to the respondent to appeal was granted.

ALLEGED TRESPASS BY A GAS COMPANY.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Tuesday, Feb. 8.

(*Before Mr. Justice* Darling *and a Special Jury.*)

Cato and Wife v. Ventnor Gas and Water Company and Another.

This was an action for damages for trespass, in putting in an execution on certain premises—Highport Towers, Ventnor—rented by plaintiffs, in respect of a judgment for £41 10s. 11d., signed, in default of appearance, after obtaining an order for substituted service. The plaintiffs afterwards had the order set aside for irregularity; and the present action was then brought. The case originally came before Mr. Justice Ridley, who non-suited the plaintiffs; but the Court of Appeal directed it to be re-tried.*

Mr. Scholefield appeared for the plaintiffs; Mr. Powell, K.C., and Mr. Mackenzie represented the defendants.

Mr. Scholefield, in opening the case at some length, narrated the circumstances out of which it arose. It appeared that the plaintiff,

* See "Journal," Vol. CV., p. 392, and Vol. CVI., p. 737.

Mr. G. P. Cato, and his wife, in 1906 took the house in question—a large house with about 5 acres of ground—which had been unoccupied for some years, at the very low rent of £40; and the claim of the Company was for gas and gas-fittings.

Mrs. *Regina Cato* was called, and her evidence-in-chief occupied the rest of the afternoon. She represented that the putting in of the execution and the consequent proceedings had prevented her getting a theatrical engagement for a considerable time, and that she had also lost a large sum from having to give up a quantity of furniture obtained on the hire system, on which about half the instalments were paid.

Witness was cross-examined in great detail, as to the position of her husband, with whom she stated she was not on good terms, who was said to have an agency for an African house, to deal in postage stamps, and to be a journalist; and also as to her putting off payment of tradesmen's accounts, rates, &c. There was also some cross-examination as to the alleged visits of Mr. Raeburn, clerk to Mr. Drew, a solicitor and co-defendant, who issued the writ and put in the sheriff.

Mr. *George Porter Cato* also gave evidence. He said there was a dispute with the Gas Company as to their account.

In cross-examination, witness stated that he never gave an address when he left home, though he might be away for weeks or months. He was once served with a writ by registered letter in Africa, but not in England. He was not now living with his wife.

Mr. *Edward B. Chester*, plaintiffs' solicitor, said they were indebted to him about £50 for costs of the proceedings for setting aside the writ. In addition to these, he recovered from the other side.

In cross-examination, witness gave the particulars of the proceedings with regard to setting aside the service of the writ, which the District Registrar saw no ground for doing. He had received, he thought, about £80 in costs from the other side; but he was not sure that it was not £120.

Mr. POWELL having submitted that the plaintiffs had suffered no damage, and that whatever had happened was, in fact, due to their own conduct,

Mr. *Raeburn*, clerk to Messrs. Buckell and Drew, said he called several days in succession at the plaintiffs' house for the purpose of serving the writ, but was unable to see anybody, except on one occasion, when Mrs. Cato told him she did not know her husband's address.

Mr. *Drew* having given formal evidence,

Mr. POWELL summed up the case for the defendants.

Mr. SCHOLEFIELD addressed the Jury in reply.

Justice DARLING summed up the case; explaining the law and commenting upon the evidence.

The JURY, without leaving the box, immediately returned a verdict for the defendants.

His LORDSHIP gave judgment accordingly, with costs, including the costs of the previous trial; and he ordered that a sum of money which had been paid into Court by the defendants, with a denial of liability, should be returned to them.

QUESTION OF LIABILITY FOR A STOPCOCK ACCIDENT.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Thursday, Feb. 10.

(*Before Justices* PHILLIMORE *and* BUCKNILL.)

Osborne v. Metropolitan Water Board.

This was an appeal by the defendants against the judgment of his Honour Judge Woodfall, at the Westminster County Court, awarding the plaintiff £30, with costs, in respect of an accident caused through tripping over an open stopcock in the pavement.

Mr. A. B. SHAW appeared for the appellants; Mr. STURGES represented the respondent.

Mr. SHAW said the facts were not in dispute; the only question was as to the application of the law to the case. The plaintiff met with the accident through putting her toe into an open stopcock which was let into the pavement by the old Lambeth Water Company; and the learned Judge in the County Court had found that this hole was a nuisance; also that the stopcock was rightly put down by the Company, but had not been properly maintained by the Water Board. The opening which led down to the stopcock was 2½ inches across. It was filled with soft straw wadding; and the defendants did not dispute the allegation that this was not level with the pavement. The Judge held that, as the Board were empowered to put in the boxes, they must be kept in such a condition as not to be a danger to persons using the streets; also that the hole was a nuisance, and that the defendants failed to keep it in a safe condition. Counsel contended that, the box having rightly been put down in the first instance as an open box, the defendants were not liable, as they had merely done what the Water Company had done. Stopcock boxes were placed in the street under statutory authority.

Justice PHILLIMORE remarked that statutory authority only gave defendants power to put down safe stopcocks.

Mr. SHAW said they called evidence to show that the box in question was one of the best type known. He submitted that the learned Judge in the Court below had misdirected himself on the law, as there had been no want of reasonable care.

Mr. STURGES supported the decision of the County Court Judge, who, he said, had, after hearing all the evidence, come to the conclusion that there was negligence in keeping the stopcock in the way in which it had been kept.

Justice PHILLIMORE asked whether it was a part of defendants' duty to put in the wadding.

Mr. STURGES said it was their duty to see that the hole was not left in a dangerous state; and in leaving it in an unguarded condition they were guilty of negligence, as had been decided by the Divisional Court in the case of *Strube v. Southwark and Vauxhall Water Company*.* Power had been given to water companies to open the roads and do what was necessary; but there was also an obligation to reinstate them, and put them in the same condition as before. Evidence was given that it was unusual to put in stopcocks that had not lids. The question of whether the hole was properly maintained must be one of fact in each case; and here no evidence was given that the box had been inspected from time to time, or that there was no depression. In fact, all the evidence was the other way; for defendants' inspector said: "We always make it a duty to put in a wad and fill up."

Justice PHILLIMORE: Do you say that a hole of this kind is a necessary evil, that it is the duty of those who make it to do what is reasonable to prevent accidents occurring, and that it is none the less their duty because their motive for making it was to protect the stopcock from frost?

Mr. STURGES said that was his contention.

Mr. SHAW, in reply, urged that there had been no negligence on the part of the Board in not keeping the box filled up and flush with the pavement. Their only duty was to protect the stopcock; and to do this they put in the wad.

Justice PHILLIMORE, in giving judgment, said this case was not without difficulty in some respects. In his opinion, there was no negligence in the original construction of these stopcock boxes by the predecessors in title of the defendants, or in the way they did without a hinged cover to them, which might prove a source of danger as much as a protection; and the County Court Judge was therefore right in holding that the defendants were not responsible simply because they were the owners of these boxes. Then came the much more difficult question of whether the owners of these things were under a liability to keep the hole containing them filled up to the level of the pavement. It was proved to have been the practice of the Water Company to put a wad of straw or hay round the spindle of the stopcock at the bottom of the hole, to preserve it from frost and grit; and if the wad did not come up to the surface, they filled it up with earth. The question was whether there was a duty on the defendants to keep watch on all these numerous appliances, to see whether the level had been so worn away that it was necessary to put in a fresh wad or to fill up the vacant space. This was a question of very great difficulty; but he had come to the conclusion, though not without hesitation, that the learned Judge might have found, on the facts proved before him, that the true inference was that, when the box was last dealt with, either no wad, or an inferior, or insufficient, one, had been put in, and that this was the cause of the accident. Whether or not he was right in drawing this inference was quite another matter; but on this ground he thought that the judgment might be supported, and that the appeal by the Water Board must fail.

Justice BUCKNILL gave judgment to similar effect. He said the case was one of great difficulty; but he could not decide that the learned Judge was wrong in coming to the conclusion that something had been omitted which was customary, and that this amounted to negligence. He therefore agreed, though with some doubt, that the appeal must be dismissed, with costs.

Mr. SHAW asked leave to appeal, if so advised.

Justice PHILLIMORE said it would be evident from the judgment that leave would be given.

* See "JOURNAL," Vol. LIII., p. 907; Vol. LIV., p. 84.

Water Supply by a Railway Company.

Mr. Justice Swinfen Eady had before him for several days recently a case in which a claim was made by certain plaintiffs against the Great Western Railway Company for a declaration of the plaintiffs' right to a good and adequate supply of water fit for drinking purposes to their school at Malvern Link, under covenants of 1863 and 1869 binding the defendants to make such supply "so far as practicable from the spring or springs in their tunnel under the Malvern Hill, so far as the supply at such spring or springs will permit," and for this purpose to "lay down and at all times thereafter maintain and provide such pipes, machinery, and apparatus as shall be sufficient for the purpose." The water supply, having been found contaminated, had been cut off by the plaintiffs in 1907 so far as concerned the house; and they claimed an injunction to restrain a breach of contract and damages. The defence was that the covenants were *ultra vires*, and that the water was required for the purposes of the railway. The evidence showed that a great deal of water was allowed to run to waste. His Lordship decided that if the true construction of the covenants was that it bound the defendants in perpetuity to supply water fit for drinking, with the obligation of laying pipes and mains, and to obtain and convey the water for all time, he was satisfied, having regard to the evidence, that they could only do so at great expense, and by depriving themselves of necessary water, that it would be *ultra vires*. But this was not the true construction. They were only bound to supply the water otherwise running to waste, as they had done, and therefore there was no breach. He preferred to decide the question on this ground. The action failed, and must consequently be dismissed with costs.

Sale of Cambridge Gas Stock.—Last Wednesday, Messrs. Wright and Scruby sold by auction £100 of original consolidated stock of the Cambridge Gas Company, carrying a dividend of 10 per cent., at £232 per £100 of stock; and £380 of consolidated "B" stock of the same Company (7 per cent.) at £154 to £156 per £100.

Theft of a Gas-Meter.—At the Plymouth Police Court, a few days ago, Frederick Pepper, described as a printer, of no fixed abode, was charged with stealing a prepayment meter containing 10d., the property of the Plymouth and Stonehouse Gas Company. A policeman met the prisoner carrying something bulky wrapped in a bag, and asked him what it was. He replied that he believed it was a slot gas-meter, judging by the rattle of money in it; and he added that a man had asked him to carry it. He was locked up on suspicion, and subsequent investigation showed that the meter had been taken from a house near the place where prisoner was found with it. Pepper, who had previously been convicted of theft, was sent to prison for three months with hard labour.

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of the Company was held last Wednesday, at De Keyser's Royal Hotel, Victoria Embankment, E.C.—Mr. CHARLES CARPENTER in the chair.

The SECRETARY (Mr. F. M'Leod) read the advertisement convening the meeting, and the minutes of the last ordinary general meeting. The seal of the Company having been affixed to the Register of Proprietors, the report and accounts (which have already appeared in the "JOURNAL") were taken as read.

The CHAIRMAN: I have now to move the reception and adoption of the report and the accounts for the past half year. You have all received a copy of these; and I have no doubt therefore you will, as usual, dispense with the formality of having them read. (Hear, hear.)

THE DIVIDEND.

I was asked the other day why we proposed to pay a dividend at the odd rate of £5 9s. 4d. per cent. I think most of you here are familiar with the working of the sliding-scale; but, for the benefit of those who are not, let me remind you that Parliament, in return for the money you have invested in the business, has given you the sole right to supply gas within a given area (a defined one) of South London, and allows you to pay a dividend of 4 per cent. upon your capital as long as you charge 3s. 1d. per 1000 cubic feet. For every penny below this figure, you are entitled to pay an extra 2s. 8d. per cent.; and as the price is now 11d. below the standard, your dividend is eleven times 2s. 8d. above the standard. This accounts for the odd figures of £5 9s. 4d. This dividend has been fully earned; and, as the report tells you, the profits of the half year allow us to increase the money we have in hand to carry forward to the next account by the sum of £12,900. There is one other matter pertaining to the capital, which I ought to mention. The charge under this head has increased by some £18,000, made up of the various items appearing under their respective headings. We have gained between 5000 and 6000 additional consumers in the half year; and the money has been required to provide the pipes necessary to give them a supply of gas, as well as meters, stoves, and fires. So much for the Company's capital and interest. The remainder of the report deals chiefly with working results.

INCREASED BUSINESS.

The half year under review has been progressive, rather than eventful. Although in too many parts of South London trade is still stagnant, yet in others it shows signs of some improvement, especially in the outer suburbs, where fewer "To Let" boards are certainly being exhibited. But a revival of trade would be of little use to us unless we obtained our share of the increased business which followed. Here, I am glad to say, our excellent outdoor staff has done good service. We have in the past few years completely reorganized this department of our undertaking; for changed conditions have made it increasingly necessary to sell gas on business lines, instead of on monopoly ones; and the fact that we have improved our gas sales to the extent of over 4 per cent. proves, I think, that we are doing so. Lest the figure may not seem as satisfactory as it really is, may I say that the increase would provide for the entire consumption of such important towns as Middlesbrough, Eastbourne, Ipswich, Tynemouth, Wigan, York, Hastings, and others. This will give you some idea of our business increasing over 4 per cent. While dealing with this subject, it may not be inappropriate if I refer to a matter about which one or two of our shareholders have asked questions.

ELECTRICITY IN WORKING-CLASS DWELLINGS.

You will have noticed several references lately in the Public Press to the operations of an undertaking which has been started to supply electricity and electric fittings to the houses of the working classes in South London. You may have thought that many hundreds of houses had been, or were being, fitted up on this new plan; but we at present have been able to find only one—a sample or show one. The idea is to dispense with meters, so that you pay according to the number of lights in use. This, I may say, was the arrangement in vogue in the early days of gas lighting, before meters had been invented. It is proposed that the landlord should collect the money in respect of the fittings' hire once a week with his rent. Let me tell you what happened to one of the Municipal undertakings in South London who built model workmen's dwellings from which gas-pipes were excluded. The tenements would not let because of the absence of this modern convenience, and, at last, they had to approach the Gas Company for supplies. These were eventually put in by special arrangement, owing to the increased cost of cutting through the concrete and solid floors of the modern erections. Well you know there is something bright and cheerful about a flame. Whether in a flat-flame or an incandescent burner, or even in an oil lamp, there is something sparkling and brilliant which is absent in the rival illuminant; and I do not think that the working classes of South London are likely to add to the normal gloom of their surroundings by acquiescing in an experiment such as that proposed. And, what about the cooking, the boiling, and the baking, which is so large a part of our slot-meter users consumption? The fact is, however, that the electrical industry of the country is not in a flourishing condition; and one cannot be surprised at even endeavours of this character being made to obtain a little more custom.

THE COAL QUESTION.

The report goes on to refer to our coal supply. You will remember that when I addressed you last August upon this subject, I expressed apprehension of what might happen when the Eight Hours Act came into force in the North of England. I am sorry to say there has been a realization of those fears; and, had it not been that we were warned in time and arranged to lay in an unusually large stock of coal, the consequences might have been very serious. Whatever the result may be—and a settlement does not yet seem to be in sight—the cost to this Company of the operation of putting the Act into force in the particular district from which our coal mainly comes, has been a considerable one. We have had for some weeks past a great deal of trouble in getting our coal picked and clean. It has been very dirty; and we have made complaints about it. Yesterday, I saw, personally, the fitter of one of the largest collieries; and he said: "Things are in such a disturbed state that, although we know the picking is badly done, we dare not say a word about it, or the men will leave their work." I know something about that condition of affairs, as I experienced it in 1889; and I am quite sure his policy is the right one. They have got to rub along as best they can; and we have to do the best we can with the coal we get. This is one result of putting the Eight Hours Act into force.

THE PORT OF LONDON ACT.

Not only this; but I must here ask your patience while I refer to another legislative enactment (the Port of London Act of 1908) which has a very important bearing upon our coal supply. A reference to this does not appear in the report, as it was hoped the proposal to which I am about to refer would not have been persisted in. You may remember that the object of the Act was to place under one authority the management of the River Thames and the various docks; and, subject to any exemptions that might be desirable, to raise, by means of rates on goods, a sufficient sum to enable the deficit to be met. Then the Board of Trade put forward an estimate made by their experts for the Committees of both Houses of Parliament, that the entire moneys to be raised, not only from dues, but including new works and the registration of craft, would be £180,000 per annum, and that a due of one shilling in the £100 would be necessary to raise £150,000. The Act specifically says that the port rates on goods not entering the docks—that is, as distinct from dock rates—shall not exceed $\frac{1}{3000}$th of the aggregate value. On coal, this would be about 0·5 of a penny per ton. But the schedule proposed by the Port of London Authority has lately been issued; and they propose a maximum figure of 3d. per ton. This is out of all proportion to the value of the material we are dealing with. A half-penny per ton would mean to this Company £2500 a year. So that they are asking for power, if they think fit, to impose a maximum of £15,000 in respect of dues. The hardship of it is that we have got all our wharves and our deep-water jetties for unloading coal, we have every facility for doing our work, and yet we are asked to pay this unreasonable amount for those who have not done so in the past. We have instructed Counsel to oppose the suggestion as strongly as possible. An inquiry is to be held at the end of this month under the presidency of Viscount St. Aldwyn; and Counsel have been instructed to appear for us and to resist them to the utmost degree.

WORKING RESULTS—RESIDUALS.

Well, I am afraid I have dealt rather fully with coal; and I will now direct your attention to the working results. Of these, the most satisfactory feature is the increased yield of gas from our raw material. Of the many problems with which we have to deal at our various gas-making stations, the carbonizing of our coal is the most important; and the results show how earnestly our engineering staff has devoted itself to the problem. Perhaps the improvement will be more clear if I say that ten years ago the figure was under 9400 cubic feet; so that the improvement is at the rate of 25 per cent. In the matter of other residuals, the least satisfactory feature is in the return from coke, which is £27,655 less than in the corresponding period. We have not been able to depend upon the cement industry, as formerly, to take our surplus production; and we have therefore had to look abroad for another market. At the same time, we feel that much may be done at home to popularize its use. We have borrowed the idea from America of selling small quantities in paper bags; and, although we cannot hope to do such a large business in this way as with our penny-in-the-slot meters, it would seem that in some districts the volume of trade to be done is not insignificant. Next to coke, our most important product is ammonia; and I am glad to say the return from it maintains its satisfactory position. Tar has suffered somewhat by reason of the low price of pitch, which is the largest residual from its distillation. According to the published returns, there is considerable shrinkage in the quantity exported. No doubt it is largely due to the increasing use of tar for road making, which has resulted in taking a good deal of pitch off the market.

CARBONIZING.

Wear and tear has been heavier; the increase arising chiefly out of repairs to coal-handling and carbonizing plant. The new methods of working referred to earlier have enabled a considerable reduction to be effected in the cost of carbonizing—viz., £7449; and we have not yet reached high-water mark in this respect.

DISTRIBUTION.

Distribution cost is also higher; but this is the outcome of present-day business requirements. The consumer wants more from us than a mere supply of gas; and, to meet a growing demand, we have had to decentralize to a considerable extent both our offices and our staff. Our local offices are increasingly popular, and are, without doubt, a great convenience toconsumers. I am pleased to say that loss by robbery from slot-meters has sensibly diminished; the figure in the balance-sheet of £361 compares with £465 a year ago. We must give the police some of the credit for this; and the assistance they have given has been very helpful.

STREET LIGHTING—INVERTED BURNERS.

I must detain you a few minutes about paragraph 6. Some years ago, we were able to make an arrangement with the various local authorities, by which the street-lamps were converted from flat-flame to incandescent burners. The cost of carrying out this work was spread over several years, and has only been recently completely repaid. You may remember that at our last meeting I was able to tell you that, by

means of inverted burners, a contract for lighting the streets of a suburban borough council has been secured, though they themselves owned an electric supply undertaking. We thought it would be good policy to offer to alter the public lamps in our own district to the newer form of inverted burners. About 2000 are already in use; and, by reason of their increased light and reduced cost, giving complete satisfaction. I am pleased to say that orders for some thousands more are now in hand.

DEATH OF A DIRECTOR.

Now, having regard to the extraordinary meeting which follows this one, I do not think I need at present say anything upon paragraph 7 of the report, which refers to the death of Mr. Cardwell and the necessity of appointing a successor.

CO-PARTNERSHIP.

Paragraph 8 deals with the question of co-partnership. Our co-partnership continues to be an increasing source of strength to the Company in all its dealings, whether with employees or consumers; and it is pleasing to note that during the past year seven other companies have followed our example and initiated schemes based very much upon our own experience. In this connection, there is an item in the balance-sheet account No. 12, on the bottom at the right-hand side, which I ought to explain. The amount of workmen's savings and bonus deposited with the Company figures at £15,000 odd, compared with £37,000 a year ago. The explanation is very simple. It is that we have more largely invested the money; and it has in consequence been taken out of the business.

THE LIVESEY MEMORIAL STATUE.

Before I conclude, I should like to say a word about the Livesey memorial statue. This has now been successfully cast; but not yet delivered by the founders. Mr. F. W. Pomeroy, the Sculptor, suggested that if it were exhibited in the forthcoming exhibition of the Royal Academy at Burlington House it would give many an opportunity of seeing the work who otherwise would not be able to do so. The Board approved of the suggestion, and gave the required permission; and I feel sure the work will be of great interest to the many thousands who visit that exhibition.

ADOPTION OF THE REPORT AND ACCOUNTS.

I now beg to move: "That the report and accounts now presented be received and adopted, and the report entered on the minutes."

The DEPUTY-CHAIRMAN (Mr. John Ewart) seconded the resolution.

The CHAIRMAN said that if any shareholder would like to make any observation, they would be very pleased to hear him.

REMARKS BY SHAREHOLDERS.

Mr. GORDON said that after the long and interesting address which they had heard from the Chairman, it would be useless to comment upon the accounts. He should, however, like to make some remarks on the reserve fund; and he wished to know why the fund had not been invested. At the opening of 1908, the fund was £186,000. Of this, £86,000 was not fully invested. At the close of 1909, it was £184,000, of which the greater part, or £94,000, was not invested, and only £90,000 was invested. A reserve fund invested in the Company's business could not be at once realized—in fact, could not be identified; and the consequence was that if the fund was not separately invested it lost its value for the purpose of the undertaking to which it owed its origin. However, he did not think it necessary to move an amendment, because the proprietors had every confidence in the Board, and he knew that any remarks made by them would receive due consideration. He urged the Board to invest the reserve fund; it was not merely advisable or convenient, it was obligatory. He was not an expert in this matter; but they had experts present in the person of the Company's Auditors, who would perhaps favour the meeting with their opinion upon that point.

The CHAIRMAN: If there are no other remarks, I will reply to those of Mr. Gordon. We have followed the practice for many years past of using the reserve fund in our business. If we had not had this money, we should have had to borrow very largely to replace it. Furthermore, I might say that, by reason of not having invested it, we have saved the result of the very large depreciation which has taken place in money that we have invested. You will remember that last half year we had to write-down to a very considerable extent two of our funds on account of the heavy depreciation which had taken place in their value by reason of the fall in the value of investments. And, owing to the fact that we had this money not so invested, but were using it in our business, we were saved the unpleasant duty of writing down to a much larger extent. We are much obliged to Mr. Gordon for raising the question, and it shall have our consideration. I need hardly say that, as far as we can see now, the procedure followed for many years past has been a satisfactory one.

The resolution was carried unanimously.

THE DIVIDEND.

The CHAIRMAN: I have now to move: "That a dividend at the rate of £5 9s. 4d. per cent. per annum be now declared, and that the warrants be transmitted to the registered addresses of the proprietors by post." I have already dealt with this when going through the accounts and the report; and I need not say anything further, except to express my belief that you will all feel that you are thoroughly entitled to the dividend which Parliament gives you on the present price of gas.

Mr. HENRY AUSTIN seconded the resolution; and it was carried unanimously.

RE-ELECTION OF THE CHAIRMAN.

Mr. JOHN EWART: I have to move "That Mr. Charles Carpenter be re-elected a Director of this Company;" and I do so with great pleasure. Mr. Carpenter was elected a Director a little more than a year ago, to fill the vacancy caused by the death of Sir George Livesey; and on the retirement of Mr. Morton, who temporarily filled that position, he was appointed Chairman of the Board by his colleagues. Mr. Carpenter now comes up in the ordinary course for re-election. It was no light task, as you can imagine, to follow so strong and able a Chairman as Sir George Livesey; but Mr. Carpenter has filled the position to the entire satisfaction of his colleagues and in the best interests of the Company. He has shown great tact and ability, as well as a sound and independent judgment in discharging the duties of his office; and he has had the loyal support of the staff. No friction or difficulty has arisen; and the working of the Company has proceeded so smoothly that it is difficult to realize that another hand has been at the helm. I believe that every department of the business is in as efficient, or a more efficient, state than ever previously in the history of the Company.

Mr. ROBERT MORTON: I have much pleasure in seconding the motion. It is quite true what Mr. Ewart has said with regard to Mr. Carpenter; and all his colleagues will, I am sure, endorse what he has said.

The CHAIRMAN: When, a little more than a year ago, you elected me to complete the term of office left unfinished by the late Sir George Livesey, I told you, in expressing my gratitude to you for it, that I would do my best to carry on the traditions he had handed on to me to maintain the integrity of the Company which he had done so much to raise to the position it now occupies. By your vote of to-day, you have granted me the longest tenure of office which the law allows; and I look upon that as your recognition of my efforts in the difficult task I have undertaken. I thank you heartily for this renewal of your confidence.

ELECTION OF AUDITOR.

Mr. EDGAR said be had much pleasure in moving: "That Mr. Thomas Spooner Soden be re-elected an Auditor of this Company." Mr. Soden had been connected with the Company for a great many years; and he hoped they would re-elect him.

Mr. GEORGE HOWLETT seconded the motion. He said Mr. Soden was a very old friend of the Company, and a very old Auditor. His office was not a mere sinecure, but required real good work not done in a perfunctory manner. The audit had been carried out to the entire satisfaction of the proprietors, and, no doubt, that of the Directors. There was no company in London better served in the audit of its accounts than the South Metropolitan Gas Company.

The resolution was passed unanimously.

Mr. T. S. SODEN: I have to thank you for re-electing me Auditor of the Company. With regard to the observations of the proprietor who spoke about the reserve fund, I think it is a very fortunate thing that we have not gone on investing. Otherwise, we should have had a large amount to write off. The other day, I was discussing with a very experienced man with regard to the reserve fund of another company; and he said that he had noticed during the last nine or ten years that sound investments had gone down in value; and it was a very good thing that money had not been put into these concerns.

The CHAIRMAN: That concludes the business of the ordinary meeting.

Extraordinary General Meeting.

The CHAIRMAN: The next business, ladies and gentlemen, is the election of a Director in the place of the late Edward Henry Cardwell; and for this purpose an extraordinary meeting has been summoned, in accordance with our Act of Parliament. No man could have been more respected by his fellows than was Mr. Cardwell—a thorough English gentleman in the best, and, in fact, in every sense of the word. The Board have spared no pains in their endeavour that his successor should be in every respect a fit and proper person; and they, in the end, unanimously supported the candidature of Mr. Kenneth Phipson Hawksley. Mr. Hawksley is a member of the firm of civil engineers of that name, who, for at least three generations, have been engaged in the construction, financing, and management of gas and water undertakings; so that he brings to the Board an experience that cannot fail to be most useful. Moreover, the honour of the position is a greater attraction to him than its fees; so I think I have said enough to show you that he is just the sort of man we want. By your election of Mr. Hawksley, you will not only give a seat at this table to a suitable Director, but you will be forwarding a policy upon which Sir George Livesey laid great stress in the later years of his life—viz., the selection as your Directors of men who, by their experience and training, were most capable of promoting the interests of the undertaking with which they were associated.

Mr. JOHN EWART, in seconding the resolution, said: I most cordially support all that the Chairman has said with regard to Mr. Hawksley's qualifications.

The resolution was carried unanimously.

The CHAIRMAN: I think I ought to explain that Mr. Hawksley has been, unfortunately, called away to Spain on a professional engagement; and, therefore, he is not able to be present this afternoon to return thanks for his election. You must wait till next half-yearly meeting before you can have the pleasure of making his personal acquaintance—those of you who do not know him now.

Mr. CHARLES HAWKSLEY: In the absence of my son, who has had the honour of being elected a Director, I should like to offer, on his behalf, his very grateful thanks to you, Sir, and your Co-Directors, and also the shareholders, for having done him the honour to place him on your Board. It is an honour he will greatly appreciate; and he will, I am sure, devote his services to the best interests of the Company.

The CHAIRMAN: That concludes the business of the extraordinary meeting.

VOTES OF THANKS.

Mr. GEORGE HOWLETT: I do not think we should break up this meeting without passing the usual, and, I think, the very necessary, vote of thanks to the Chairman, the Board, and the Staff. That is, I believe, generally taken as two resolutions; but, at any rate, I move a vote of thanks to the Chairman and Board for taking charge of the Company's affairs and bringing them to such a successful issue. One proprietor spoke of the reserve fund. I feel perfectly certain that if we leave that where it is in the hands of the Directors it will be as successful in the future as it has been in the past. Of course, the Board will discuss it, and no doubt the questions asked will be answered at the next half-yearly meeting. We have a reserve fund; and there was no trouble about getting at it when we spent it all over

the strike some years ago—it turned up automatically without any trouble. I have no doubt, if it is your desire that it should be invested in gilt-edged securities, there will be no difficulty in getting rid of the stock in which it is invested. This is in the lap of the gods for the future; but I have no hesitation in saying that if it remains where it is, we, as shareholders, have nothing to do but congratulate ourselves with regard to all matters in connection with the Company. We know the Chairman, and his cleverness and ability, backed up by the Board of Directors who know their business. They have been at it for many years; and if they don't know it now, they never will. Hence the security of the Company as it stands to-day.

Mr. H. WEST seconded the motion.

The resolution was carried unanimously.

The CHAIRMAN: On behalf of myself and colleagues, I thank you very heartily for this vote of thanks. You have an admirable Board, who not only discuss without fear or favour the various matters with which we have to deal, but we are thoroughly united in our desire for the welfare of the Company; and, for myself, I cannot be too grateful for the loyal support they have given me on every occasion. Before I sit down, you will perhaps allow me to propose a vote of thanks to the Staff and workmen for the attention they have given to the Company's business. Mr. Gibb, who represents the engineering side, and will make "his first appearance" to-day, I am happy to say, has fully justified the expectations we formed of him. And Mr. M'Leod, who represents the commercial side of our undertaking, I cannot speak of too highly; he has been through the mill in the broadest and truest sense of the word, and his technical knowledge has been of great service to him in the position he occupies.

Mr. W. DOIG GIBB (Chief Engineer): Mr. Chairman, ladies and gentleman, I have been here for too brief a time to be able to give you much information about the business of your great Company; but it may interest you to know that, coming as a stranger among you, I have been cheered and encouraged by one thing, and that is, to find your Chairman not only a highly-trained and technical man who knows every hole and corner of your property, but a gentleman ready and willing to impart his information to others, and to help me to try and be as efficient as he was when he filled a similar position to mine. As regards co-partnership, it may interest you also to know that, coming among you as I have done and gaining experience for the first time, I can assure you that there is an *esprit de corps*, a good feeling of happy brotherhood among the men and the officials such as I have not experienced to a similar extent in other works where co-partnership did not exist. On behalf of myself and my brother officers, I beg to thank you for this vote of thanks. My brother officers are true co-partners, for they are working hand in hand with me. With the Chairman's help and your sympathy, I hope I may be in the future an efficient link in the chain of the Company's success.

Mr. M'LEOD: I must thank you, Sir, for your generous reference to the staff, including myself; and I thank you all, ladies and gentlemen, for your cordial endorsement of the Chairman's words. After what Mr. Gibb has said, I need add nothing to emphasize what you must by this time have realized—that the whole of our staff, including every grade, and all the men, are united in their desire to further the interests of the Company, which really means yours and ours. I can assure you that every official is keenly alive to the necessity of being intelligent and efficient to that end. They do their best; and I am sure there is not a staff in the country that could be better manned and who could work with more loyal intelligence than our officers do. That this will continue, I feel confident; and, in their name, I thank you very sincerely for your kind vote.

BRENTFORD GAS COMPANY.

The Half-Yearly Ordinary General Meeting of the Company was held last Friday, at the St. Ermin's Hotel, Caxton Street, S.W.—Mr. ULICK J. BURKE in the chair.

The SECRETARY (Mr. William Mann) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

THE RESULTS OF THE HALF YEAR—A HIGH MAKE.

The CHAIRMAN, in moving the adoption of the report and accounts, said he was glad to be able again to give a good record both of working and of results. The sum of the half-year's working was that there had been sold 21 million cubic feet more gas; and this had been accomplished on a saving in coal and oil of £10,113. No doubt the proprietors would agree with him that this showed satisfactory management. Its results enabled the Board, with a profit of £42,691 added to the amount brought from last half-year's accounts, to recommend the dividends notified in the report. To give more precise details of the accounts, the actual saving of coal and oil was due largely to an increased sale of gas per ton; the amount sold per ton being 11,028 cubic feet, compared with 10,770 cubic feet during the corresponding half of last year. The actual make per ton was 12,096 cubic feet. Purification had cost less; and carbonizing wages had increased by only £59. On the other hand, coke, despite the increased sale of ¾ cwt. per ton of coal—due to improved working at Southall—showed a decreased revenue of £2500, in consequence of the lower prices ruling when the contracts were made. He need hardly tell the proprietors that coke was very often a fleeting difficulty. It was a market they could not control. The price was low when the contracts were made; but now—and every gas company probably found the same thing—they had yards practically empty of coke, and in many cases contractors calling out for supplies. Then, in continuance of the policy outlined on former occasions, it would be seen by the accounts that the expenditure on wear and tear of works and machinery was still in excess of the average; but he believed he had gone into the matter thoroughly at previous meetings, and so perhaps he need not again enter on a justification of this very necessary expenditure. It might be, however, that the proprietors would be glad to have some idea as to what was likely to be further spent. To run a gas-works profitably nowadays, it was necessary to have up-to-date plant and machinery, and the gas industry was especially up-to-date with invention; so that an active management could not afford, at any time, to rest on its oars and to congratulate itself upon having a complete machine. Subject, however, to this proviso, he was glad to give the proprietors a hope that the works in two years' time, so far as present intentions in regard to their reconstruction were concerned, would call for little further expenditure other than ordinary wear and tear.

COMPLETE FREEDOM.

And when this large outlay had been met, they would very readily turn to a policy that was always present in their counsels as an important object—that was, the reduction of the price charged for gas. This question of the reduction of the price of gas was one of the most important with which they had to deal. He would go so far as to say that he ventured to think that all the obligations imposed upon them with regard to the testing of gas for illuminating power, or (it might be in the future) calorific power and even that watchdog the sliding-scale, might perfectly well be left out of Acts of Parliament altogether. What he meant by this was that the policy of the Directors must always be to send out the best gas they could (especially in these days of sharp competition), and at the lowest possible price. To this end, he need not tell them they kept the works in thorough manageable order, and this was one of the main things to which they constantly turned their attention. The price of gas was now 2s. 9d.; and they looked forward to the time when they would be able to reduce it.

MISCELLANEOUS POINTS.

Then the proprietors would like to learn something as to prospects. The Company had a splendid district, and a developing one. There was one very good feature in these days in connection with all gas undertakings, and that was the very great output of stoves. These had the one considerable advantage that they operated on the daylight consumption, whereas in former days they had a lot of plant lying idle in the daytime. Gas-stoves contributed to altering this; and so they fostered this branch of the business as much as possible. Then, as the proprietors were aware, the Directors issued the other day £30,000 of new stock, and it was readily taken up, and at good prices. A rather gratifying feature, he thought, was that the stock was taken up very largely by local people. All they wanted now was good "gas weather." The weather had not been particularly propitious to gas undertakings during the past half year. But he thought the Company would show better results still in two years' time than it did now; and he believed they would do exceedingly well in the coming year. As a matter of fact, the increase in consumption had not been so great in the past half year as had been the case with some other companies, nor as great as they might have hoped for. It was not quite 2 per cent. But there was this remarkable feature about it. Comparing the past half year with the corresponding period of the year before, they had in 1908 the Franco-British Exhibition, which then did very well for the Company. They did not do so well through the exhibition last year; but they looked forward to a large increase through the Japan-British Exhibition. There was this remarkable point about the increase last half year—that whereas it was not quite 2 per cent. in the half year, the increase on the second quarter was nearly 4 per cent. The second quarter about synchronized with the time the exhibition closed, so this indicated that the exhibition had an effect upon the rate of increase in the first quarter. The increase from Jan. 1 to Feb. 5 this year had been at the rate of about 5 per cent.

Mr. R. J. N. NEVILLE seconded the motion. He remarked that the Board, as a whole, were confident that the expenditure which they were now incurring was being spent in the most economical manner, and for the very best of all possible purposes—viz., the cheapening of the price of gas, in order to extend, in the largest measure, the consumption of gas throughout the district. They had in Mr. Johnston an excellent and efficient engineer, whose ideas were entirely up-to-date, and who enabled the Board, if he might say so, to "skim the cream" of the new ideas which were continually coming forward. He had introduced to the Board an enormous number of pieces of reconstruction and remodelling which would be, in course of time, taken in hand, and the Board were convinced they were on the right tack.

Mr. RAND inquired whether the coalite process was likely to cheapen the cost of gas.

The CHAIRMAN said he did not think it was likely to cheapen anything, unless it was the sale of coke. He did not, however, like to give any definite opinion upon it; but he should say that it would not injure their coke sales. It would be quite easy for them to adopt a somewhat similar process if there was a demand.

Mr. RAND explained that he referred to the manufacture of gas.

Mr. NEVILLE: The make of gas per ton of coal is so small that it would not pay us.

The motion was unanimously carried.

Proposed by the CHAIRMAN, and seconded by Mr. NEVILLE, dividends were declared at the rate of 5 per cent. per annum on the 5 per cent. preference stock, at the rate of 12½ per cent. per annum on the consolidated stock, and at the rate of 9½ per cent. per annum on the new 1881 stock—all subject to income-tax.

Moved by Colonel A. H. W. COWIE, and seconded by Mr. H. H. BATTEN, the retiring Directors—Mr. Ulick J. Burke, Mr. R. J. N. Neville, and Mr. D. Milne Watson—were re-elected.

Proposed by Mr. T. WILKINS, and seconded by Mr. PERCY ADAMS, the Auditors (Mr. Monier F. Monier-Williams and Mr. Alfred Bevis) were re-appointed.

The Standard Burner Bill.

A Special General Meeting was then held for the consideration of the following resolution: "That this meeting having considered the Bill now pending in Parliament intituled 'A Bill to provide in the case of certain gas companies for the adoption of the "Metropolitan" argand burner No. 2 as a standard burner in substitution for the various burners now in use for the official testing of the illuminating power of gas supplied by them and for other purposes,' hereby approves

the same, subject to such additions, alterations, and amendments as Parliament may see fit to make therein."

The SECRETARY having read the notice convening the meeting,

The CHAIRMAN moved the resolution, remarking that, as the proprietors were aware, the Company, together with others, proposed to introduce a Bill in Parliament to alter, or at all events to settle and determine, the class of burner by which the gas was to be tested. The Company's present obligations, as regulated by their Act of 1868, required the testing-meter to be furnished with an argand 15-hole burner and a 7-inch chimney, or other approved burner and chimney. But there were no words in the Act prescribing by whom the "other" burner was to be approved; and the position was therefore ill-defined and uncertain. It was very desirable, as notably for purposes of comparison between the gas of different companies, that one uniform burner should be prescribed. The Board of Trade Committee which held an inquiry some time back as to this and other matters made certain recommendations, which led to the adoption by the authorities of the Carpenter "Metropolitan" burner No. 2; and since 1905 Parliament had prescribed the use of this burner in the case of no less than 62 companies and 16 local authorities. He might remind the proprietors that, in the City of London Gas Act, 1868, the principle was laid down that "the burner should be such as shall be most suitable for obtaining from the gas the greatest amount of light, and be practicable for use by the consumer." And the new burner complied with this very principle. He could not quite understand how any opposition could be offered by the local authorities. The Directors had not heard of any petition being put in from their district; and, in fact, they knew one or two of the District Councils were not likely to take any action. The Directors, under all the circumstances, thought it desirable to join with other companies in the promotion of the Bill, in order that the testing of their gas should be on the modern and approved lines.

Mr. R. J. N. NEVILLE seconded the motion, which, after a short conversational discussion, was unanimously carried.

On the proposition of Mr. T. WILKINS, seconded by Mr. NUNN, a hearty vote of thanks was passed to the Chairman and Directors. A similar acknowledgment was also made of the services of the chief officials and staff generally, on the motion of Mr. GEORGE BIRD, seconded by Mr. S. RICHMOND. The CHAIRMAN responded for himself and colleagues; and Mr. MANN and Mr. JOHNSTON for themselves and their respective staffs.

NEWPORT (MON.) GAS COMPANY.

The Half-Yearly General Meeting of this Company was held on Monday last week—Dr. H. MELVILL BREWER in the chair.

The SECRETARY (Mr. T. H. Hazell) having read the notice convening the meeting, the report of the Directors, with the accounts for the six months ended Dec. 31, was presented. The report opened with an expression of the Directors' regret at the death of Mr. Richard Laybourne, who was for 24 years a Director, and for the last ten years the Chairman, of the Company. Major J. C. Rennie Brewer had been elected a Director in his stead. During the six months there had been an extension of the Company's area of supply to the populous district of Rogerstone. The accounts showed that the revenue in the six months had been £39,647, and the expenditure £31,538; leaving £8109 to go to the profit and loss account, the balance on which available for distribution was £10,390. Out of this, the Directors recommended the payment of the statutory dividends.

The CHAIRMAN, in moving the adoption of the report, referred in feeling terms to the irreparable loss the Company had sustained by the death of his predecessor in the chair; and he proposed a resolution of sympathy with the late Mr. Laybourne's bereaved family. [The shareholders signified their approval by rising.] Proceeding to deal with the half-year's working, the Chairman said it had been satisfactory, as was shown by the accounts. The expenditure on capital account had increased, mainly owing to the extension of the supply to Rogerstone, where gas had been installed in preference to electricity, which was originally proposed there. The revenue account showed an increase in the consumption of gas by 5 per cent.; being 174 million cubic feet, against 165 millions in the corresponding period of 1908. Coke showed an improvement of £260, and tar of £180. The fittings account also showed very favourably; radiator heaters and gas-fires being two items that were growing rapidly. The profit balance for the half year was £8109, against £7995 this time last year. The Works Thrift Society was doing well. Its funds, representing the savings of their employees, showed an increase in deposits of about £300; and upon these there was allowed interest of 4 per cent. against 2½ per cent. allowed by the Post Office.

Mr. T. G. CARTWRIGHT seconded the motion; and it was carried.

A dividend at the rate of 5 per cent. per annum was then declared for the past half year.

A vote of thanks having been accorded to the Chairman, Directors, and officials,

The CHAIRMAN returned thanks.

The SECRETARY also acknowledged the vote, and stated that during the 24 years Dr. Brewer had been a member of the Board the business of the Company had increased two-and-a-half times.

The ENGINEER (Alderman Canning), replying on behalf of his department, said he could assure the Directors and shareholders that in the Crindau works, which had been largely remodelled, they possessed one of the most modern gas-works in the kingdom. The works were extending daily, and there was no doubt there would be a great deal of work before the Board in the future.

This brought the business of the ordinary meeting to a close.

A Special Meeting was then held to consider the Gas Companies Standard Burner Bill (No. 3), of which the Company are one of the promoters. Mr. Canning explained the scope of the Bill; and, after a few questions had been answered, it was sanctioned.

At the meeting of the Bridgnorth Town Council last Tuesday, it was reported that the make of gas last year was 28,439,000 cubic feet, which exceeded the previous highest record by 441,000 cubic feet.

SOUTH SUBURBAN GAS COMPANY.

Half-Yearly Report and Accounts.

The following is the report of the Directors of the Company for the six months ended Dec. 31, which, with the accounts for this period, will be presented at the half-yearly general meeting next Friday.

The consumption of gas shows an increase of 3·41 per cent.—the largest which has been experienced by the Company for several years. Consequent upon this increase, the receipts for gas are nearly equal to those for the corresponding half of last year, notwithstanding the reduction in price of 1d. per 1000 cubic feet, which took effect from the 1st of July last.

Owing chiefly to more favourable contracts, there is a saving in the cost of coal, although a greater quantity had to be used in order to meet the larger demand for gas. The expenditure, however, on repairs and maintenance of works and plant, and distribution charges, has exceeded that of the corresponding half year; and rates are also £202 more. On the other side of the account, the receipts for coke and tar show substantial increases; and there is a satisfactory addition of £209 to meters and stoves at rent.

After providing for the debenture interest, and including the balance of £10,269 brought forward from last half year, the balance available for dividend is £29,084; and the Directors recommend the payment of dividends at the rate of 5 per cent. per annum on the 5 per cent. preference stock, and at the rate of £5 13s. 4d. per cent. per annum on the ordinary stock (this being the full dividend arising from the reduced price of gas, and authorized under the provisions of the sliding-scale)—carrying forward to next half year £10,442.

The Directors report with much satisfaction an unprecedented and sustained demand for gas-fires and gas-heaters of various kinds for domestic use. They regard this as a very encouraging result of their efforts to popularize this use of gas among the consumers, and as unmistakable evidence of the growing appreciation of gas as a heating agent. In fact, for all purposes for which heat is required in the household, gas is not only the most convenient and the most adaptable form of fuel, but it is also the cheapest, taking into account its cleanliness and the small amount of attendance required by it.

The accounts accompanying the report show that the total expenditure on capital account at the close of the year was £805,058, or £26,305 less than the receipts, inclusive of the premium capital—£831,363 in all. The principal items of expenditure were £1330 on new buildings and plant and £701 on new and additional gas-stoves. The revenue from the sale of gas was £82,214; the rental of meters and stoves produced £6578; the sale of residuals, £27,435; and a small item of rents brought up the total receipts to £116,307. The following were the principal items of expenditure: Manufacture of gas (including £45,560 for coal and £12,915 for maintenance of works and plant), £65,111; distribution, £16,205; management, £5535—rents, rates, and taxes (£4979)—miscellaneous items bringing up the total to £94,651. Among these items is a sum of £1700 charged on account of the co-partnership scheme. The balance carried to the net revenue account is £21,650; and the amount applicable for dividend is £29,084.

The statements as to working show that 63,500 tons of coal were carbonized in the half year. The quantity of gas made was 735,917,000 cubic feet, of which 682,442,000 cubic feet were sold and 691,371,000 cubic feet were accounted for. The residuals were: Coke, 762,000 cwt., of which 149,528 cwt. (estimated) was used in manufacture; breeze, 15,571 yards; tar, 639,635 gallons; ammoniacal liquor, 16,432 butts—the make of sulphate of ammonia being 656 tons.

CROYDON GAS COMPANY.

Half-Yearly Report and Accounts.

In the report to be presented at the meeting of the Croydon Gas Company next Friday, the Directors state that the sales of gas in the six months ended the 31st of December exceeded those in the corresponding period of 1908 by 5·54 per cent.; and that the number of consumers increased by 1177. There was a satisfactory extension of the use of gas for cooking and heating, particularly for the latter purpose. The number of stoves on hire was increased in the half year by 444 cookers and 1117 fires; while 43 and 440 respectively were sold to consumers—making a total increase of 2044. The system of giving free attention to incandescent burners, which was commenced in October, has been much appreciated by the consumers. The number of premises at which these burners are regularly attended to by the Company increased in the three months from 800 to 2025.

The accounts accompanying the report show that the total revenue was £119,379, of which £86,610 was derived from the sale of gas, £9053 from rental of meters and stoves, and £23,591 from the disposal of residuals. A sum of £58,013 was expended on manufacture, and £17,391 on distribution; rent, rates, and taxes came to £4480; management cost £4337; and the total expenses (inclusive of £600 for the co-partnership scheme) were £89,456. The balance carried to the profit and loss account is £29,923; and the amount available for distribution is £30,089. The Directors recommend the payment of dividends at the rates of 14½, 11½, 10, and 5 per cent. per annum, all less income-tax, on the various classes of stock. This will absorb £22,624, and leave a balance of £7465.

The statements relating to the working show that, under the supervision of Mr. J. W. Helps, the Engineer and General Manager, 43,225 tons of coal and 524,910 gallons of oil were used during the half year to manufacture 677,032,000 cubic feet of gas, of which 636,451,200 feet were sold and 643,858,400 feet accounted for. The estimated quantities of residuals produced were: Coke, 25,935 tons; breeze, 5066 tons; tar, 551,327 gallons; ammoniacal liquor, 1,152,823 gallons—the make of sulphate being 414 tons.

BOURNEMOUTH GAS AND WATER COMPANY.

Half-Yearly Report and Accounts.

In the report which the Directors of the Bournemouth Gas and Water Company will present at the half-yearly meeting next Friday, they state that the sales of gas in the six months ended Dec. 31 last show a substantial increase by comparison with the corresponding half of 1908; and there was a satisfactory increase in the water-rental. Coal cost less; but the proceeds of the sales of residuals showed a small diminution. The accounts accompanying the report note that the revenue from gas was £50,992, and from water £19,324; the total receipts being £88,572. The expenditure (including £980 for the co-partnership scheme and expenses) was £61,596; leaving £26,976 to go to the profit and loss account; compared with £24,654 at the end of December, 1908. The balance available for distribution is £44,743; and the Directors recommend the payment of dividends (less income-tax) for the half year at the rates of 6 and 7 per cent. per annum on the preference and "B" ordinary shares respectively, and at the rate of 15 per cent. per annum on the original capital of £50,000. These dividends will amount to £16,913, and leave an amount of £27,830 to be carried forward.

The statements relating to the working results show that, under the supervision of Mr. Harold W. Woodall, the Engineer and General Manager, 21,850 tons of coal, 221 tons of cannel, and 408,143 gallons of enriching oil were used in the production of 403,125,000 cubic feet of gas, of which 363,400,574 cubic feet were sold and 374,635,854 cubic feet accounted for. The residuals produced were: Coke, 13,267 tons; breeze, 1631 tons; tar, 243,367 gallons; and sulphate of ammonia, 197 tons.

PORTSEA ISLAND GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Saturday—Mr. R. EDGCOMBE HELLYER in the chair.

The SECRETARY (Mr. H. A. Stibbs) having read the notice convening the meeting, the report of the Directors, with the accounts for the six months ended Dec. 31, was presented. The Directors expressed the deepest regret at the loss of their much-esteemed colleague Sir John Baker, M.P., who, as a Director for 37 years and Chairman for 16 years, had rendered services of inestimable value to the Company. The former Deputy-Chairman (Mr. R. E. Hellyer) had been elected Chairman, and Mr. F. M. Aylen Deputy-Chairman; while Colonel C. L. Owen, who had resigned his position as an Auditor, had been elected a member of the Board. The past half year had been one of steady progress. The general demand for gas had been maintained; and the number of consumers had again appreciably increased. The removal of the Jetty at the Flathouse works, which was required by the Admiralty, had been effected; and in its stead, a travelling crane, with elevating and conveying plant, had been installed. It was anticipated that the new method of discharging and loading vessels at these works would not entail any additional cost to the Company. The gratuitous inspection and adjustment of the consumers' incandescent burners at regular intervals had been considerably extended; and the greatly increased lighting efficiency thus afforded was much appreciated. A scheme for the superannuation of the officers of the Company had been established on a mutually contributory basis. It came into operation at the commencement of this year. The Engineer and General Manager (Mr. J. D. Ashworth) reported that the buildings and plant at the several stations, and also the mains and meters, had been adequately maintained, and were in efficient working order. The accounts accompanying the report showed that the revenue for the half year amounted to £113,773, and the expenditure to £94,682; leaving £19,091 to go to the profit and loss account, on which there was a balance of £40,582 available for distribution. This enabled the Directors to recommend the declaration of dividends for the six months at the rate of 13 per cent. per annum on the "A" and "B" shares, 12 per cent. per annum on the "C" shares, 10 per cent. per annum on the "D" and "E" shares, and 5 per cent. per annum on the stock—all less income-tax; leaving a sum of £22,650 to be carried forward to the next accounts.

The CHAIRMAN, in moving the adoption of the report, prefaced his remarks on the half-year's working with a tribute to the memory of the late Chairman, and to the invaluable services rendered by him in the management of the Company. Commenting on the other matters mentioned in the report, he remarked that the new coal-handling plant at the Flathouse works had been in use for several weeks, and was affording entire satisfaction; and though it had been adopted as a necessity, consequent upon the removal of the jetty, a saving in the cost of working was anticipated from its introduction. Turning to the accounts, he pointed out that though, owing to the lower prices obtainable, the revenue from the sale of coke and tar in the past six months had been less than for the corresponding period of last year, the receipts from the sale of gas and from other sources had increased; and with the considerably reduced cost of fuel and the saving effected in labour, the balance carried to the profit and loss account was £19,091, compared with £17,766 in 1908, though £2200 was charged against the current half year's revenue for extraordinary renewals.

The DEPUTY-CHAIRMAN (Mr. F. M. Aylen) seconded the motion.

A SHAREHOLDER referred to the decrease in the receipts from the sale of the residuals named by the Chairman, and expressed some doubt as to the present position and future prospects of the Company.

The CHAIRMAN was able to prove very clearly that such pessimistic views were absolutely groundless.

The report and accounts were then adopted with one dissentient.

The retiring Directors and Auditor having been unanimously re-elected,

Mr. A. BOOKER proposed that the Directors' remuneration be increased to 1500 guineas per annum, free of income-tax. He pointed out that by the absorption of the Portsea Island Gas-Fittings Company, Limited, the Gas Company had benefited largely; but that while the emoluments of the Auditor and officials had been made good, the Directors were £150 out of pocket, owing to the loss of their fees—the *personnel* of the two Boards being identical. After remarking on the recent growth of the Company, the speaker gave the rate of remuneration paid by other undertakings of similar magnitude, and showed that, by comparison, the Directors of the Portsea Company were inadequately paid for their services.

Mr. T. BRADDOCK seconded the motion, which was strongly supported by Mr. ERNEST EDMONDS.

A direct negative was proposed, as was also a reduction of the present fees by £100. Neither, however, was seconded; and, after some discussion, the motion was carried.

The meeting terminated with the customary vote of thanks to the Chairman and Directors, and also to the officers and staff, to which the CHAIRMAN replied.

PROVINCIAL GAS COMPANIES.

Launceston Gas Company's Increased Profit.

The report submitted to the annual meeting of the Launceston Gas Company yesterday week stated that it had been found necessary to replace one of the gasholders which had been in use since the establishment of the works, at a cost of £365. Great attention had been paid to the matter of leakage, with the result that it had been considerably reduced. This, together with a larger sale of gas, enabled the Directors to show an increased profit. A dividend of 7s. per share was recommended. The Chairman (Dr. W. F. Thompson) said Messrs. Willey and Co. were consulted with reference to the condition of the holders, and recommended that one be turned into a tar-tank, while another was fit for nothing. In replacing it, the Directors adopted the least expensive plan. The quantity of coal carbonized was 1457 tons, as compared with 1706 tons the previous year, which showed that the attention paid to the matter of leakage had had its effect. The Directors had considered the question of applying for a Provisional Order, and were almost unanimously in favour of it. Whether it should be for gas only, or for gas and electricity, would be considered later. The cost of coal during the past year had been £1403, compared with £1734 the previous year; and the total expenditure was £2709, as against £2872. The income from the sale of gas was £2659, as compared with £2563. In reply to a question, the Chairman said the wages of the men had been increased because they asked for it; no application was received from the Manager. Mr. Hoare proposed that the salary of the Manager be taken into consideration; and this was agreed to. Mr. Treleaven, jun., remarked that the question of a reduction of the price of gas would receive the attention of the Directors.

Improved Carbonizing Results at Littleborough.

The half-yearly meeting of this Company was held on Thursday, the 27th ult.—Mr. J. C. Hudson presiding. The balance-sheet submitted showed a falling off in receipts from gas sales, being £4387 compared with £4501, due to the recent reduction in price. The actual consumption, however, showed an increase of 2½ per cent., which was considered satisfactory, taking into account the depressed state of trade. Residual products realized £1229, against £1140; and the balance of net profit, subject to dividend, was £2861, compared with £2747 last year. A dividend of 10 per cent. per annum was declared. Improved carbonizing results were again reported; the average yield of gas per ton of coal being 11,136 cubic feet against 10,990 cubic feet. The total quantity of gas made during the twelve months ended Dec. 31 was 68¼ millions, which is a record. The sales of gas have increased 25 per cent. during the last five years, despite the fact that the district has not developed, and that most of the mills and works have adopted during that period high and low pressure incandescent lighting; resulting in many cases in 30 to 50 per cent. reduction in consumption. Satisfactory increases were reported in the use of gas for domestic and trade purposes; while the popularity of the slot-meter was proved by the increasing demand for it, as well as by the higher consumption per meter, due to further facilities for the supply of cooking appliances, and also to the cash discount recently granted. Satisfaction was expressed by the shareholders at the sound financial condition of the Company; and thanks were given to the Directors, the Manager and Secretary (Mr. S. E. Halliwell), and the staff.

Malton Gas Company and their Assessment.

The report presented at the half-yearly meeting last Wednesday of the Malton Gas Company stated that the revenue account showed a profit of £1636 on the six months' trading. The balance standing to the credit of the profit and loss account, including £2016 brought forward, and after payment of the interest on the mortgages, is £3693. The Directors recommended the payment therefrom of a dividend at the rate of 6 per cent. for the half year, free of income-tax—making 12 per cent. for the year. The total revenue for the half year was £5209. In moving the adoption of the report, the Chairman (Mr. H. W. Pearson) remarked that the accounts were satisfactory. One point to which he wished to draw special attention was the action of the Assessment Committee of the Malton Union. The Company had made an appeal to them to reduce their assessment. There had been no reduction on the assessment on the works, &c., notwithstanding that, by reason of the Company having lost the lighting of the streets, they had had to write off about £600 as loss on capital and sale of plant, &c., caused by such deprivation. After the employment of two experts, the Assessment Committee had practically agreed to the claim of the Company that some reduction in the assessment was necessary. In fact, they met the Company very nearly in their demand. But, singular to say, a short time after this, the Assessment Committee served a notice on the Company that they proposed a very large increase of the assessment—actually above what they had appealed against in the first instance. This was altogether inexplicable. The Company would most strenuously resist the proposed increase in the assessment, and would go to Quarter Sessions and fight it out. The report was adopted, and the dividend declared.

BRISTOL GAS COMPANY'S BILL.

Opposition by the Corporation.

At the Meeting of the Bristol Corporation last Tuesday, the report of the Parliamentary Bills Committee with reference to the Bill of the Bristol Gas Company, which was noticed in the "JOURNAL" last week (p. 377), was brought up.

Alderman PEARSON, in moving the adoption of the report, said the Committee had dealt with the Bill from the point of view of the ratepayers and the consumers. The Corporation had no concern with the gas undertaking, which could take very good care of itself. In order that the Council might better appreciate the attitude taken up by the Committee, he would put before them broadly the position occupied by the Gas Company. The Company was formed to give, and they had the sole right to give, the public a supply of gas. This conferred on them, for all practical purposes, a monopoly in the supply of gas in the city. In consideration of having this monopoly, the Company had been put under certain restrictions. They were limited in the dividend they could pay and in the reserve they might create. The first departure from this position occurred in 1891, when the Company promoted a Bill to give them power, among other things, to split their stock, which meant that they doubled the amount of their existing stock, upon which they paid one-half of their former dividend. The amount of the stock was consequently increased from £511,250 to £1,022,500. This was apparently a domestic concern; but it enabled the Company to create an additional £50,000 of reserve before the consumer obtained a penny in the way of a reduction in the price of gas. The Committee had considered the present Bill from this point of view. One of the main features to which they had directed their attention was the proposal made for raising money to pay off the debenture holders by agreement; and the Committee thought that this might operate badly for the consumers. Then there was the somewhat important clause (No. 12), which dealt with the creation of what was called the second reserve. It amounted to this—that the Company asked leave to create a reserve which would be an additional one. Then they went a step farther, for this reserve was not to be raised upon actual capital subscribed, but upon the amount subscribed *plus* the premiums which had been paid on the sale of stock. This would, of course, increase the amount of reserve which it would be possible to raise under the clause. There was also the question as to the quality and the mode of testing the gas. He might say he had learnt with considerable surprise that sulphur in gas, so far from being injurious, was a thing rather to be desired, and that it should not be considered an impurity unless it took the shape of sulphuric acid. The Company also desired to vary very materially the mode of testing, which at present was comparatively easy and quickly done, whereas their proposal would make it more lengthy and difficult; and he believed that if the system suggested was carried out, it would be practically impossible for the Corporation to proceed against the Company for not supplying gas of the proper quality. At present, the gas was tested, and found to be either good or bad. Under the proposed arrangement, they could take the average of a three days' test. He thought this was a matter which would require attention. The Company asked leave to lay pipes in streets not dedicated to the public use. He did not object to this, as his ambition was to see gas or electricity in every street in the city. But he thought the pipes in streets not dedicated to the public use should be laid subject to the approval of the Corporation officials, as these streets would subsequantly become public thoroughfares. Nor was there any objection to the power sought to lay pipes for general purposes, if they were placed in positions approved by officials of the Council. Dealing with the stand-by clause, he said the reason the Committee opposed this being in the hands of the Company while it was being allowed in the case of the electricity undertaking was that the Electricity Committee undertook to manufacture and supply, and they could not store. Therefore when they undertook to furnish a supply they must have machinery to cover the maximum demand reasonably expected to arise. In the case of the Gas Company things were different, as their maximum was limited to their capacity to store. The Committee considered it would be unwise to place the Company in a position to say, for instance, to an electricity consumer: "If you want gas for cooking, you shall not have it unless you give up your supply of electricity, or pay us what we consider to be a fair interest on the money we spend to give you this supply." No doubt they would have an opportunity of discussing matters before the questiom came to the Committee of the House of Commons; and the Parliamentary Bills' Committee would be prepared to listen to any explanations that might be offered.

The report was adopted.

Meeting of the Gas Company.

The Annual General Meeting of the Gas Company was held last Thursday—Alderman J. W. S. DIX, the Chairman, presiding.

The SECRETARY (Mr. John Phillips) read the notice convening the meeting; and the report and accounts for the year ended Dec. 31 were presented. The Directors expressed their pleasure in reporting that the revenue account, after paying the yearly maximum dividend on the general capital stock and interest on the debenture stock, showed a profit balance of £929; and they felt that this result fully justified the position they took in 1907 in refraining from raising the price of gas, notwithstanding the large increase in the cost of coal. The profit and loss account showed a balance of £14,262 carried forward to the credit of the next account. The Directors recommended a dividend for the six months ended Dec. 31 at the rate of 5 per cent. per annum, subject to the deduction of income-tax.

The CHAIRMAN, in moving the adoption of the report and accounts, said he was pleased that the Company had been able to pull through the coal boom and not raise the price of gas. They had done this, and without egotism he thought he might claim credit for the officials for the way in which they carried on the Company's business. The increase in it was most marked, and in directions beside that of lighting. In 1888, they commenced hiring-out cookers; in 1892, they had 2196 out; and in 1909, this number had increased to 41,500. Prepayment meters were adopted in 1891, when they had 20 out; whereas to-day there were 21,997 fixed. This enormous increase, he was happy to state, was still continuing; and he ventured to think that the time was not far distant when there would be scarcely a house in Bristol in which a gas-cooker would not be in use. Gas-fires were also exceedingly useful, and made a great deal less work for servants. The shareholders had before them a statement of the progress which had been made by the Company during 47 years, so they could judge for themselves of its extremely satisfactory position.

Mr. FENWICK RICHARDS (Deputy-Chairman) seconded the motion; and it was carried unanimously.

The retiring Directors and Auditor having been re-elected, the dividend recommended was declared.

A Special General Meeting was then held to sanction the Bill of which the Company have given notice, by which they seek power to raise an additional £400,000 of capital.

Mr. T. D. SIBLY, the Solicitor of the Company, having read the provisions of the Bill,

The CHAIRMAN, in answer to questions by shareholders, said the new capital would be used for extensions from time to time as found necessary, and the proposed addition should be sufficient for many years to come. It would be possible to apply some of the new capital for providing increased storage capacity, if it was required; but at present they were very well off in this respect. There was some threatened opposition to the Bill; but this was generally expected. The Company, he claimed, were entitled to the consideration of the consumers and ratepayers of Bristol for the way in which they had discharged their responsibilities. Opposition might possibly come from the municipal authorities; but there would be a conference, and the objections would doubtless be whittled down. If not, the Company were prepared to go to the House of Commons and say they were asking only for what was reasonable, and what they must have if they were to go on with their business. He could say that there would be no attempt to refuse to supply gas for cooking at places where electricity was used for lighting. The Directors recognized that electricity had its province as well as gas, and there was scope for both.

The promotion of the Bill was unanimously approved by the shareholders, and the proceedings terminated.

WICKLOW COUNCIL AND THE GAS COMPANY'S BILL.

Suggested Agreement.

A Special Meeting of the Wicklow Urban District Council was held on Monday last week to consider a report by a Committee of the entire Council on the subject of the Wicklow Gas Bill, and to hear the views of the Directors of the Gas Company with reference to the proposals of the Council.

The Committee recommended that consent should be given to the passing of the Bill subject to the following modifications: (1) That the standard price should be fixed at 4s. 4d. per 1000 cubic feet; the prices charged to consumers for the next three years to be reduced to 4s. 4d. for lighting, 4s. for cookers, and 3s. 8d. for power. (2) That all future mains be laid at a depth of 2 ft. 6 in. where practicable, and, except where rock is met with, the depth not to be less than 1 ft. 6 in. from the top of the socket to the surface of the roadway; no public mains to be laid between the 1st of April and the 1st of October without the written consent of the Council. (3) That a purchase clause be inserted in the Bill empowering the Council to purchase the interests of the Gas Company in the works at any period during the three years following the passing of the Bill. (4) That the Council's Solicitor be requested to instruct Parliamentary Agents to draft and submit clauses embodying these recommendations to the promoters and to the Council for approval. (5) That the additional capital is not to exceed £4000.

Mr. G. W. Anderson, a Director of the Gas Company, said his co-Directors were quite in agreement with clauses 2, 3, and 5. With regard to clause 3, it was understood that purchase would be by arbitration under the Land Purchase Act. Clause 1 was the *crux* of the whole Bill. The Gas Company were prepared to accept 4s. 6d. as the standard price of gas; and if the Council amended the clause accordingly, the Company would be agreeable to have it put in the Bill. They would also agree to reduce the price to 4s. 9d. for three years. The reason they would do so was that, so far as they could see, the extra cost of opposition would mean an expense of £200 or £300 on the Company; and the consumers might as well have the benefit of this as the London lawyers.

After some discussion, it was decided to adopt all the recommendations of the Committee except the first, which was amended as follows: "That the standard price of gas named in the Bill be fixed at 4s. 6d.; the price to be charged to consumers for the next three years following the passing of the Act shall not exceed 4s. 9d. for lighting, 4s. 5d. for cookers, and 4s. 1d. for power. The whole resolution to be subject to the Gas Company agreeing to the clauses to be prepared by the Council's agents."

Reductions in Price.

The price of gas at Bournemouth will be reduced by 2d. per 1000 cubic feet as from the 25th prox. The Coleraine Urban District Council have, on the recommendation of the Gas Committee, reduced the price of gas from 3s. 6d. to 3s. 4d. per 1000 cubic feet to all consumers except those using gas for power purposes, the charge for which will be lowered to 2s. 11d.; and they have allowed a rebate of 5 per cent. to all consumers of 250,000 cubic feet and upwards per annum. The new rates will come into force as from the 1st of April. The Exeter Gas Company announce a reduction from 2s. 9d. to 2s. 7d. per 1000 cubic feet in the price of gas for general purposes, and of 1d. per 1000 cubic feet from the prices now paid for gas used by engines; in both cases to operate as from Christmas last. The Wandsworth and Putney Gas Company have reduced their price by 1d. per 1000 cubic feet, making it 1s. 10d.

GAS COMPANIES (STANDARD BURNER) BILL.

The question of opposing or supporting the proposal contained in the above-named Bill has been much under discussion lately in the districts served by the Gas Companies associated in promoting it; and we give an epitome of the proceedings in some of the most prominent places.

Plymouth.

A report on the proceedings of the conference of local authorities affected by the Bill was presented to the General Purposes Committee of the Plymouth Town Council last Tuesday. The Town Clerk and the Electrical Engineer (who has control of the public lighting) attended the conference of local authorities held in London last month as representatives of the Plymouth Corporation. In their report, they stated that the number of authorities who sent delegates to the conference was fully representative of the districts affected. They then set forth the purpose of the Bill, and stated that the substitution of the proposed new standard burner would effect a reduction in the quality of the gas now supplied to Plymouth of from 1½ to 2 candles, and that the consumers of gas for lighting purposes would be prejudiced to this extent. Those who employed gas for cooking, heating, and motive power would, they said, also be prejudiced (by reason of the fact that the calorific value of gas of low illuminating power is less than that of gas of higher illuminating power), and such consumers must accordingly use more gas to obtain the same heat or power. No provision was made for any equivalent for this, or any reduction in price. The reporters gave the text of the resolutions passed by the conference, and then pointed out that, as the time for petitioning against the Bill would expire on the 19th inst., it was obvious that if the Corporation should decide to petition, they would be able to do so with greater force in association with the other authorities affected than on their own account. They added that the cost of opposition or negotiation as the case might be would be quite insignificant; and that the resolutions had been so framed that the expense of opposition would cease if and so soon as terms were arranged. The Committee decided to present a petition against the Bill. Reference was made to the fact that the Gas Company had hitherto dealt with the matter in a friendly way; and it was decided to suggest to the Company that Plymouth should be omitted from the Bill, in order to avoid further controversy.

Mr. J. H. S. May, the Deputy-Chairman, presided at a special meeting of the Plymouth and Stonehouse Gas Company held last Thursday for the purpose of sanctioning the promotion of the Standard Burner Bill. Mr. J. Shelly, the Solicitor to the Company, read the Bill, and briefly explained its legal effect. The Chairman, in moving that sanction be given to the promotion of the Bill, explained that under the old Acts of Parliament a standard burner for testing gas was adopted when the illuminating power was from 16 to 20 candles. In more recent times, upon the introduction of incandescent lighting and the great increase by all classes in the use of gas for cooking and heating, it was found that it was more to the public advantage to make a gas of lower illuminating power; thereby enabling the gas to be supplied at a lower price than would otherwise be possible. It was now well known that 14-candle gas gave precisely the same illuminating power with the incandescent mantle as 18-candle gas. By a recent Act, and as the result of negotiations with the Plymouth Corporation, the illuminating power of the gas was agreed to be 14 candles—a standard which had been adopted in several other towns. It was discovered, however, in London and other places where the lower candle power had also been adopted with parliamentary sanction, that the test-burner of the old pattern, while very suitable for testing gas of 16 candles and upwards, did not give a true result when gas below this power had to be tested. The South Metropolitan Gas Company went to Parliament, and, after careful investigation, and the consideration of expert evidence by a Committee, it was decided that a new burner should be adopted as a standard for testing the gas of low candle power. This burner—the "Metropolitan" argand No. 2—had been adopted by that Company, by the Gaslight and Coke Company, and by a considerable number of other gas companies and corporations, with the sanction of Parliament and of the municipalities concerned. An effort was now being made to have this standard burner adopted generally, so that the testing of gas throughout the country might be as far as possible uniform. Until recently, they had not been aware that there would be opposition to this on the part of the municipalities. They now knew, however, that it was to be offered; but they hoped it would not be persisted in. It should be remembered that if any small saving were made by the Company as a result of the adoption of the new standard burner, fully four-fifths of the benefit would, under the sliding-scale arrangement, go to the consumers in a reduction of the price of gas. The illuminating power of the gas supplied in Plymouth would continue to be 14 candles, as fixed by their present Act of Parliament, to which the Municipality assented. There were 61 gas companies and 15 local authorities owning gas-works already using the new burner. Mr. H. Wilcocks seconded the motion; and, after a few observations by shareholders, it was carried unanimously.

Exeter.

At a meeting of the Exeter City Council last Wednesday, the Parliamentary Committee recommended that, in order to protect the interests of the inhabitants of the city, it was advisable that the Council co-operate with the other local authorities in opposing the Gas Companies Standard Burner Bills intended to be introduced into Parliament in the ensuing session, and that for this purpose a petition against Bill (No. 3) be presented to Parliament. They had also decided that the Town Clerk should issue the requisite statutory notices of a special meeting of the City Council for the determination of the presentation of a petition against the Bill, and the incurring of the requisite expense. Mr. Munro having moved the adoption of the report, Mr. Glanfield said he did not see the use of spending a lot of money to oppose the Bill. There were several corporate bodies who were opposing the Bill; and they might be right, because they might have some grievance against the local gas company, or they might want some concession. But in the case of Exeter he did not see that they had any grievance nor did the Parliamentary Committee make out a case. They did not give any reason why the Council should go to the expense of opposing the Bill, which was an endeavour to obtain for the consumer the benefit of the best and fairest test-burner. The use of the new burner would tend directly to cheapen gas; so that they would not be doing a good turn, but rather a bad one, for the general public. The general consumers were in the habit of using incandescent mantles instead of the old-fashioned flat-flame burner; and therefore, if they could get a cheaper gas, it was for the public benefit for them to get as cheap a commodity as possible. Therefore there was no reason to oppose the Bill, because, after all, it would be a public matter, and be legislated upon in Parliament. If the Council had a grievance, or wanted any concession from the Company, they would be within their rights in opposing the Bill. He proposed that the matter be referred back to the Committee. There was no seconder of this proposition, so it fell to the ground, and the recommendation of the Committee was adopted.

Hastings.

At the meeting of the Hastings Town Council on the 4th inst., the Public Lighting Committee reported that some time since they received a letter from Mr. C. E. Botley, the Engineer and General Manager of the Hastings and St. Leonards Gas Company, on the subject of a Bill which certain gas companies intended to promote with the object of obtaining power to substitute, for gas-testing purposes, the "Metropolitan" argand burner No. 2 for the burners prescribed by the companies Acts. The Committee subsequently received from Mr. Botley a print of the Bill, and, having had letters from other local authorities affected by it, they deputed the Chairman (Mr. Blackman), Alderman Chesterfield, and the Borough Engineer to attend a conference of local authorities interested in this and two other similar Bills, held at Westminster Palace Hotel, on the 27th of January. The conference passed resolutions to the effect that the Bills should be opposed, and that the local authorities within the areas affected by the Bills should be asked to petition against them. The grounds upon which experts had advised that the Bills should be opposed were that the substitution of the proposed new burner for the existing statutory burners would effect a reduction in the illuminating power of gas now being supplied; that the reduction would affect adversely every type of burner employed for illuminating power purposes; and that consumers who used gas for cooking, heating, and motive power would also be adversely affected by the change. The Committee, being decidedly of opinion that the Bill should be opposed by the Council, had authorized the Town Clerk to take all necessary steps in the matter. Mr. Blackman, in moving the adoption of the report, said that, unless opposition was offered to the scheme, they, as gas consumers, stood to lose. The cost of the petition would be about £17; and it had to be lodged by the 19th inst. The Council could decide later what course they would adopt. Mr. Whitlock seconded the motion; and the report was adopted without discussion.

At the meeting of the London County Council last Tuesday, it was decided, without discussion, to oppose the Bill, and to charge the expense to the county fund. Resolutions to oppose have also been passed by the Corporations of Guildford, Ipswich, Maidenhead, Newport (Mon.), Southampton, and Swansea, as well as by the Walton-on-Thames Urban District Council.

EXPLOSION AT THE COATBRIDGE GAS-WORKS.

Purifiers Wrecked.

About ten o'clock last Thursday night, a violent explosion of gas occurred in the purifier-house at the Coatbridge Gas-Works. The house was an iron structure, and contained four purifier boxes, 24 feet square, which were erected in 1896. There was a chamber 6 feet in depth below the purifiers, which rested upon dwarf walls. The explosion occurred in this chamber; and so great was its force that it lifted the purifier-boxes, completely wrecking them, and entirely destroying the purifier-house, besides doing much damage to the engine-house and the Manager's office. At the time of the explosion, the stokers for the night shift had just gathered about the retort-house. One of them, named James Scott, who was outside the retort-house at the time, was lifted over a fence 6 feet high, and was badly cut and bruised. He was taken to the hospital. There was no other personal injury. The explosion created much alarm in the town. The sound of it was heard a considerable distance, and there was much destruction to windows in the neighbourhood of the works; the glass in several hundreds having been broken. After the explosion the retorts were drawn, and other precautions taken to prevent mishap to the gasholders, which had, fortunately, escaped unscathed.

On Friday, the Directors met, and arrangements were made for the purification of the gas by the use of milk of lime in a tower scrubber, by which means the manufacture of gas was enabled to be proceeded with. Arrangements are also being made with all haste for the reconstruction of the purifying plant. The cause of the explosion has not so far been discovered.

Extensions of the Sutton Gas-Works.

The Directors of the Sutton Gas Company have decided to instal a bench of seven Klönne regenerative settings of eight retorts in each, 22 in. by 16 in. by 22 ft. long, to be operated by De Brouwer stoking machinery, including a bench of seven existing settings in the same retort-house. At a meeting of the Board last week, contracts were placed for the retort bench and settings and for the coal-handling plant. Messrs. Cockey and Sons, of Frome, will erect the steelwork and retort-bench mountings, including overhead coal hoppers. The De Brouwer stoking machinery, with the coke-handling plant, will be placed with Messrs. W. J. Jenkins and Co., of Retford. Each bench will be capable of making 9 million cubic feet of gas per day; so that the capacity of the house will be increased to 2 millions per 24 hours, and the whole of the operations, from the delivery of coal into works to coke on bank, will be mechanical. The work will be carried out in accordance with plans and specifications prepared by and under the supervision of Mr. G. Mead-Robins, M.I.Mech.E., the Engineer of the Company, and Mr. J. Ferguson Bell, M.Inst.C.E., of Derby, the Consulting Engineer.

GAS AND BYE-PRODUCTS IN THE UNITED STATES.

In previous issues of the "JOURNAL," reference has been made to the particulars relating to the production of gas and residuals in the United States in the years 1907 and 1908 which Professor E. W. Parker, of the United States Geological Survey, has published, through the Department of the Interior, as an advance chapter of the Mineral Resources of the United States for 1908. An abstract of this chapter was made for the "American Gaslight Journal" by Mr. H. Thurston Owens, and it furnishes the following statistics.

During the year 1908, there were nearly 157,000 million cubic feet of artificial gas produced, which was sold for some $133,000,000; being an increase of $7,000,000, over 1907. To this should be added upwards of $37,000,000 received for bye-products.

The number of coal and water gas companies reporting shows a decrease in the former and an increase in the latter, as follows:—

Type of Works.	1907.	1908.	Inc.	Dec.
Coal gas	516	506	..	10
Water gas	520	552	32	..
Total	1036	1058	22	..

The decrease in the number of coal-gas companies has been going on since 1904, when there were 534 companies reporting. However, the output from coal-gas works showed approximately the same percentage of increase as that from water-gas works—viz., 9 per cent. The business depression was plainly shown in the output of the retort-oven plants, for these showed a loss of 21 per cent. The total increase for all was 7½ million cubic feet, or 5 per cent., as will be seen from the following figures (thousands of cubic feet):—

	1907.	1908.	Increase.
Coal gas—			
Retort-ovens	20,516,731	16,205,925	4,310,806*
Gas-works	34,302,954	37,355,888	3,052,939
Water gas—			
Gas-works	94,634,620	103,347,497	8,712,877
Total	149,454,305	156,909,310	7,455,003

* Decrease.

In spite of a loss in the output of coal gas of more than 1½ million cubic feet, there was an increase in the amount received, owing to an increased price per 1000 cubic feet. The totals are as follows:—

	1907.	1908.	Increase.
Coal gas	$36,462,304	$37,227,901	$765,597
Water gas	90,173,112	96,343,221	6,170,109
Total	$126,635,416	$133,571,122	$6,935,706

In calculating the average price received per 1000 cubic feet sold, the Government has bulked the retort-oven and the gas-works coal gas; so that these figures give no indication as to the average price received for high-grade gas. The figures for water gas, however, show the ever-downward trend of the price of this commodity.

	1905.	1907.	1908.
Coal gas	0·81	0·67	0·70
Water gas	1·00	0·95	0·93

The proportion sold for illuminating and fuel purposes shows that, while there was a loss in the sales of coal gas for fuel, this was offset by the gain in water gas. The striking feature, however, is the gain of upwards of 7 per cent. in the sales of gas for illuminating purposes.

Year.	Kind of Gas.	Illumination.	Fuel.	Total.
1907	Coal	30,256,774,000	24,662,911,000	54,819,685,000
1907	Water	71,931,612,000	22,703,008,000	94,634,620,000
1908	Coal	32,485,571,000	21,076,242,000	53,561,813,000
1908	Water	76,804,546,000	26,542,951,000	103,347,497,000
1907	Both	102,088,386,000	47,365,919,000	149,454,305,000
1908	Both	109,290,117,000	47,619,193,000	156,909,310,000

The gas unaccounted for still reaches enormous totals, but with a decided decrease in quantity and a larger decrease on a percentage basis; the totals being given as follows:—

	1907.	1908.
Coal gas	3,422,861,000	3,382,856,000
Water gas	7,505,225,000	6,889,706,000
Total	11,928,116,000	10,272,562,000

In point of sales, New York leads all the other States in coal gas; but it is second to Pennsylvania in the sales for fuel purposes. Sales of 1000 millions or more are recorded in thirteen States. The average price received for gas in 1908 was 70 c. per 1000 cubic feet; ranging from 47 c. in Pennsylvania to 208 c. in California and Oregon. For illuminating purposes, the average was 73 c.; ranging from 35 c. in Wisconsin to 209 c. in California and Oregon. The latter also leads in the price received for fuel gas, with 206 c.; while the average in the lowest (Pennsylvania) was only 13 c.

More than one-third of the water gas sold in America is credited to New York; and fourteen States sold upwards of 1000 million cubic feet. The average price received for water gas was 93 c.; but in only eleven States was the average less than $1—New York being the lowest, with 84 c. Comparing the price received for gas for fuel purposes with that for illumination, the fuel gas commanded a higher price—viz., 98 c.—against 92 c. for illuminating gas. Taking individual States, in five the price was the same for both gases, and in ten the price for fuel gas was higher.

The residual products show a loss in value of nearly $10,000,000, almost wholly due to the greatly diminished business of retort-oven plants. In the matter of coke, the quantity shows a loss of 23 per cent., and the value 29 per cent. The total sales are as follows:—

	1907.	1908.	Decrease.
Coke, in short tons	8,093,144	6,253,125	1,840,019
,, value	$30,332,644	$21,507,045	$8,825,599
Tar, in gallons	117,991,777	110,430,663	7,561,114
,, value	$2,993,568	$2,766,700	$226,868
Anhydrous ammonia, in lbs.	37,560,858	30,615,835	6,945,023
,, ,, value.	$2,601,057	$2,065,169	$535,888
Ammonium sulphate, in lbs.	48,882,237	44,093,437	4,788,800
,, ,, value.	$1,525,472	$1,322,807	$202,665
Total value	$37,452,741	$27,661,721	$9,791,020

The quantity of coal carbonized in 1908 was greater than that for 1905, but was 2¼ million short tons less than for 1907. The proportion used in gas-works increased from 35 to 38 per cent.

	1907.	Per Cent.	1908.	Per Cent.	Decrease.
Gas-works	4,030,074	35	3,553,920	38	476,154
Retort-ovens	7,460,587	65	5,699,058	62	1,761,529
Total	11,490,661	..	9,252,978	..	2,237,683

The yield of coke in short tons sold, shows a decrease of from 70·7 per cent. in 1907 to 63·9 per cent. in 1908; and the price has also fallen from $3·75 to $3·44 per ton. The loss occurred in the retort-oven product, which sold for only 1 c. more per ton than the gas-works coke.

	1907. Quantity.	Price.	1908. Quantity.	Price.	Decrease.
Gas-works	2,510,106	$3·45	2,051,899	$3·43	458,207
Retort-ovens	5,583,038	3·86	4,201,226	3·44	1,381,812
Total	8,093,144	$3·75	6,253,125	$3·44	1,840,019

The figures for yield of gas are, to say the least, startling, as, according to the statistics, there was 2000 cubic feet more gas sold for every ton of coal carbonized in gas-works in the year 1908 compared with the previous year.

	1907.	1908.
Gas-works	8512	10,511
Retort-ovens	2750	2,844

The sales of tar show that the product of gas-works was the only one indicating an increase, though the quantity produced by water-gas works remaining unsold, added to that sold, would also show an increase. Two fields where tar could be sold to advantage—briquetting and road surfacing—remain practically undeveloped; and Mr. Thurston Owens thinks these will undoubtedly receive more attention than has hitherto been the case. The figures of the sales of tar are (in gallons):

	1907.	1908.	Decrease.
Retort-ovens	53,995,795	42,720,609	11,275,186
Coal-gas works	49,581,965	58,541,220	8,959,255†
Water-gas plant	14,414,017	9,167,834*	5,245,183
Total	117,901,777	110,430,663	7,561,114

* In addition, 5,559,199 gallons were produced but not sold. † Increase.

COST OF GAS AND ELECTRIC LIGHTING.

"The Times" Contributor Replies to Mr. Hanbury Thomas.

The Engineering Supplement to "The Times" last Wednesday contained the following reply by their contributor to the letter of Mr. Hanbury Thomas, given in the "JOURNAL" last week (p. 372).

Mr. Hanbury Thomas particularizes too much to prove his case with regard to the relative cost of gas and electric lighting. He must not confine the comparison to towns in the coal area or to seaside places supplied by water-borne coal. Nor should he rest his case on the experiments of a "responsible electrician," made with a few lamps. I could equally well quote against him the conclusion of Sir William Preece, that one can arrive at the price per unit at which electric light would cost the same as gas, in every-day use, by dividing by six the cost of gas per 1000 cubic feet. This was in the days of the carbon filament lamp; and therefore it follows that with the metal filament lamp one would have to divide by two or three to arrive at the necessary result. Hence in Sheffield consumers could well afford to pay 5d. per unit, and still spend no more than they would on gas.

But, surely, the only test is whether the public approve of electric light sufficiently to adopt it extensively and to an increasing degree. Therefore the fact that there are about 25 million electric lights in use in this country, that the capital sunk is something like £80,000,000, and that these figures are increasing by leaps and bounds, is more convincing than any arguments in water-tight compartments. Similarly, it is obviously unfair to compare the cost of lamp renewals with mantle renewals, when the latter are carried out under a maintenance scheme. If a tungsten lamp is "nursed," it will burn for 3000 hours (say, three years), and costs 2s. 9d.; this is equivalent to the cost of mantle renewals at Sheffield for three years with mantles at 3½d.

As regards the question of reflection and concentration, Mr. Hanbury Thomas is evidently unacquainted with the latest developments in "Holophane" lighting, by which the best general effects are obtained by fixing the electric lamps on the ceilings of the rooms. When he can show me that gas can be treated in the same way, under equal conditions of safety and convenience, I will admit that the light from a gas-fitting (not gas *per se*) is subject to the same physical laws as that from an electric lamp.

With reference to the questions of ventilation and the products of combustion, if people will close up all windows and doors, or builders provide no means of escape for foul air, it is certain that the conditions are worse with gas than with electric light; and the latter must not be blamed for the emanations of human beings. Mr. Hanbury Thomas must not ask us to believe, in spite of his ingenious arguments, that the added carbonic acid gas from gas lighting is an improvement to the

atmosphere, or that the moisture due to the combustion of gas is desirable, from the point of view either of the decorations of the room or of its occupants. Surely, therefore, electric lighting must take precedence over gas lighting also from the hygienic point of view. It neither gives off moisture to destroy the decorations, nor carbonic acid gas, which, though it may be a desirable diluent in the eyes of some men of science, enters to only a very small extent into Nature's original prescription for that atmosphere which is indispensable to our existence.

The same number of the Engineering Supplement contained the following editorial remarks on the correspondence.

It has reluctantly to be confessed that the correspondence which has recently appeared in our columns in regard to the relative costs of gas and electric lighting reveals at least as much of the misplaced ingenuity that occasionally masquerades as commercial shrewdness as it does of the desire for truth directed towards accurate knowledge. The champions of gas as an illuminant declare that the idea that carbonic acid is itself poisonous has long been abandoned; but in condemning their adversary, they do not hesitate to cite the report of a Medical Officer of Health who discovered that the air in an electrically lighted council chamber contained "four or five times more carbonic acid gas" than did the air outside. How are the general public to be guided by such statements? In the absence of evidence as to the proportion of carbonic acid gas in the atmosphere outside, such testimony is valueless. Again, the advocates of electricity as an illuminant bring forward comparative instances, in the shape of quarterly bills for gas and for electricity, to indicate that, under practical conditions and in similar circumstances, except that the light is alleged to be better in the electrical case, the cost is from 25 to 50 per cent. in favour of electric lighting. To this the votaries of the gas industry reply with a flat denial; and they support their contention by another set of quarterly bills, in which gas appears to save a proportion even greater than that claimed by their competitors for electric lighting. We have published the letters because they are characteristic of methods which are scarcely worthy of the great organizations that control the progress of illumination in this country. The gas industry has at its command some of the foremost chemists and physicists of our time. The electrical industry is blessed with an unrivalled wealth of means for precise measurement. The public, therefore, have a right to ask for a truce to loose statements; and engineers will do well to see that their reports and papers are not misrepresented by the departments responsible for sales.

THE GASLIGHT AND COKE COMPANY'S PROGRESS.

An Appreciative Review of the Position.

There appeared in last Wednesday's "Financial Times" an article dealing with the Gaslight and Coke Company which sets forth the improved position of affairs in so clear and well-reasoned a manner that we are taking the opportunity of reproducing it. Additional interest is lent to the article by the fact that it follows so closely upon the half-yearly meeting of the Company.

The vital importance of personality in the administration of joint-stock enterprises of magnitude has been often demonstrated, but rarely more strikingly than in the recent history of one of our most important Metropolitan undertakings—the Gaslight and Coke Company. The proprietors of this Company, at their half-yearly meeting last week, expressed their satisfaction with the accounts laid before them, and with the Governor's statement as to future prospects. But we doubt if many, or any, of the proprietors (present or absent) clearly realized the magnitude of the change that has taken place in the position and prospects of their undertaking, or the extent to which that change is due to one dominant personality—that of Mr. Corbet Woodall, the Governor of the Company. On Jan. 1 last, the Company extended the area of its operations by the absorption of the district of the West Ham Gas Company; and the present is therefore a fitting opportunity for reviewing the progress of the Gaslight and Coke Company under the management that has rescued it from the difficult and insecure position it occupied a few years ago, and placed it in the far sounder and more hopeful position in which it now stands.

Not many years ago, it will be remembered, the Gaslight and Coke Company stood seriously discredited in the eyes of the local authorities and of Parliament, which repeatedly rejected the Bills it presented for increased capital powers, and eventually caused inquiry to be made into its administration by a Special Committee (presided over by Sir James Rankin), which reported unfavourably to the management. The Company, moreover, was highly unpopular with the public, who regarded it as an unprogressive, uncommercial, and arbitrary concern, with which they had as little to do as possible; while, naturally, the management was unpopular with shareholders, who saw their property depreciated and their dividends diminished. Now, after a few years of changed administration, all this has been altered. Last session saw a Bill for the extension of the Company's operations into the West Ham district, for the adjustment of the Company's standard illuminating power to modern conditions, and for other useful purposes, passed by Parliament, with the City Corporation and the London County Council—keen critics in former years—freely consenting. The Company is now regarded as an up-to-date, business-like, and obliging firm, conducting its affairs on thoroughly commercial lines; and people are therefore willing to deal with it freely, while the shareholders are rejoiced to see their stock substantially enhanced in value and their dividends rising—surely, if but slowly, as befits an undertaking that is still overweighted with capital. The change in the attitude of the investing public towards the Company cannot be more strikingly illustrated than by the fact that, while the dividend on the ordinary stock has only risen from £4 8s. to £4 13s. 4d. per cent. in the past seven years, the market price of the stock has risen from 85 to 105 in the same period.

That the Company is still overweighted with capital is proved by the fact that the capital expended per million cubic feet sold in the case of this century-old undertaking is at least 50 per cent. in excess of that which has been expended by more modern companies. The following table shows that during the past four years this problem has been tackled in no uncertain fashion:—

Capital Expended in Relation to Gas Sold.

Year.	Gas Sold in Millions of Cubic Feet.	Capital Expended to Dec. 31 Less Redemptions.	Capital per Million Cubic Feet of Gas Sold.
		£	£
1897	21,023	12,387,613	589
1902	21,034	13,012,055	619
Increase over 1897 .	11	624,442	—
1905	21,018	13,350,087	635
Increase over 1902 .	— 16	338,032	—
1909	22,540	13,434,590	596
Increase over 1905 .	1,522	84,503	—

Here we see, up to 1902, a reckless increase in capital expenditure, with a stagnant business. Then, up to 1905, a modified rate of increase in capital, with the business going slightly back, instead of forward. Finally, during the past four years, virtually no addition to capital, with a substantial advance in sales. Practically all the ground lost in the preceding eight years was recovered in the last four; and there is every hope that, with a progressive commercial policy bringing a steady increase in sales, while rigid control is kept over capital expenditure, the capital cost per million cubic feet of gas sold will go lower and lower in the future.

While the capital account has been thus soundly treated, the general financial position of the Company has also been greatly strengthened, despite several reductions in the price of gas, as will be readily seen from the next table.

Reserves.

At Dec. 31.	Undivided Profit, Redemption, Reserve, and Insurance Funds.	Suspense Account for Expenditure on Automatic Meter Supplies.	Net Reserves less Suspense Account.
	£	£	£
1897	129,362	281,446	—152,084
1902	210,727	111,918	98,809
1905	338,292	62,355	275,937
1909	661,797	nil	661,797
Improvement in reserves since 1897 . .			813,881

This tremendous improvement in the Company's financial position has been accompanied by continuous advance in methods of manufacture, which have not only materially cheapened production, but have also put the Company's works into a position to cope with increased business in the future without increased capital expenditure. This is clear from the following comparison of the gas made and the raw materials from which it was produced during the past half year and the same half of 1905.

December Half Year.	Gas Made. Millions of Cubic Feet.	Coals Carbonized. Tons.	Oil and Spirit Used. Gallons.
1905	11,236	832,989	8,228,142
1909	12,110	805,265	7,251,759
	Inc. 874	Dec. 27,724	Dec. 976,383

It may be added that the expenditure on maintenance (including remodelling) of works and plant during the past four years (£1,504,000) has been heavier than in any preceding similar period—further evidence of a wise policy, which will bear good fruit in the future.

An important feature in the Company's recent history is the introduction last year of a liberal system of co-partnership, whereby practical proof is given of the coincidence of interests of capital and labour. A bonus of nearly £39,000 was given last June to the staff and workmen of the Company to inaugurate the system—being the amount they would have received if the plan had been in force for the preceding two years. During the past half year, a further sum of £13,000 was set aside on account of co-partnership, which promises to do much towards the elimination of the possibility of trouble between employer and employed, and to produce better working results by the increased energy and zeal of the individual workers.

The history of the Company in the past few years may then be briefly summarized as follows:—

1.—A stagnant, unpopular business transformed into a progressive, well-regarded undertaking.

2.—Capital account rescued from a most dangerous position and policy, and reserves strengthened by £800,000.

3.—Cost of manufacture reduced by improved engineering and adequate expenditure on reorganization and remodelling of works.

4.—Price of gas reduced from 3s. to 2s. 8d. per 1000 cubic feet—this being discounted to the extent of 1d. by the re-introduction of meter-rents.

5.—Employees made shareholders.

6.—Dividend increased from £4 8s. to £4 13s. 4d. per cent.

7.—Price of ordinary stock raised from 85 to 105.

It is common knowledge in the gas world, but is not generally known by either the gas consuming or the investing public, that the credit for this revolution—for revolution it truly is—in the position of

the Company is due to the initiative and to the administrative, as well as technical, abilities of the present head of the Company, Mr. Corbet Woodall; and it is but just that this fact should be put on record, for the financial benefit of the change, alike to the consumer, the shareholder, and the employee, has been enormous. The reductions in the price of gas represent (roughly) £300,000 a year to the consumers; a rise of twenty points in the ordinary stock represents £3,000,000 to the holders; and co-partnership will mean £30,000 a year and upwards to the employees. Mr. Woodall joined the Board of the Company towards the end of 1897, eventually becoming Governor in February, 1906; and he has since devoted himself to the restoration of the Company's fortunes—already commenced under his influence—in which task he has been ably seconded by the General Manager (Mr. D. Milne Watson) and the other members of the staff he has gathered around him. On the result Mr. Woodall is to be warmly complimented; and the consumers, the shareholders, and the employees—a trio of parallel interests—are to be congratulated.

PAISLEY CORPORATION GAS UNDERTAKING.

Additional Capital for Extensions.

On Thursday last, an inquiry was held by Sheriff Kennedy, in the Sheriff Court at Paisley, in regard to an application to the Secretary for Scotland by the Provost, Magistrates, and Councillors of the Burgh of Paisley for a Provisional Order authorizing them to borrow £60,000 for the purposes of the Paisley Gas Acts. The Town Clerk (Mr. Frank Martin) appeared on behalf of the Council.

The Town Chamberlain (Mr. R. Thomson) explained the financial position of the gas undertaking. He said the Gas Company was formed in 1823, and by an Act passed in 1870 the control of the undertaking was vested in the Corporation. The latter had obtained several Provisional Orders for borrowing a total sum of £115,000. The capital expended was £177,842; and there had been spent out of the surplus profits £25,047—making in all £202,889. There had been paid from time to time out of surplus profits £83,055 for public improvements; while there had been transferred to the credit of the electricity accounts £18,758 to meet debit balances. No calls had, however, been made upon the gas revenues for the electricity account since 1904, when the undertaking became self-supporting. The Corporation were empowered to charge 4s. 2d. per 1000 cubic feet for gas; but they had fixed the price at 2s. 3d. In his opinion, there was ample security for the loan.

Mr. George R. Hislop, the Gas Manager, said he had held this position for 45 years. The present application had been made in consequence of a report submitted by him to the Corporation in November last, in which he stated that certain extensions would have to be made during the next seven years. The improvements would consist of a retort-house and retorts, at an estimated cost of £5580; coal bunkers and conveyors, £1200; additional ammonia still and condenser, £550; extension of the coal-stores with elevated railway, £4800; extension of 14 and 16 inch mains, £1000; new workshops, £1200; additional exhausters, £600; additional section to washer, £350; carburetted water-gas plant, £7600; two additional purifiers, £1600; and mains-pipes, cooking-stoves, and meters, £35,520. All the extensions were, in his opinion, absolutely necessary. Last mid-winter they had only a 10½ per cent. reserve of output, and this was dangerously low for a commercial town. Storage of coal was also becoming a serious matter, as in December last they had only eight days' requirements; and with the miners not working at the New Year holidays, they had to adopt stringent measures to keep up the supply of gas. The new storage would give them accommodation for 3300 tons of coal, equal to 41 days' requirements at the present rate of consumption; and the carburetted water-gas plant would provide a good stand-by in emergencies such as fog, intense cold, &c.

Provost Muir Mackean and Mr. P. K. Millar, the Convener of the Gas Committee, concurred in the evidence given as to the necessity for the enlargement of the works.

Sheriff Kennedy remarked that he was quite satisfied with the evidence.

There were no objectors; and the inquiry closed.

Demand for Coke at Barry.—The Barry Gas and Water Committee were informed at their last meeting by Mr. T. E. Franklin, the Gas Engineer and Manager, that an excessive demand for coke still continued, and they had on occasions to decline to book further orders; the coke being taken away almost as soon as it was made. Mr. J. T. Hogg, the Chairman of the Committee, remarked that he was satisfied the time had come when they should raise the price of coke, for there was no place in the country where it was sold so cheap. It should have some relation to the price of coal. The Committee agreed to increase the price 1d. per cwt.

Instow Water Supply.—An inquiry was held at Instow, North Devon, last Thursday week, by Mr. A. W. Brightmore, a Local Government Board Inspector, relative to an application made by the Barnstaple Rural District Council for power to borrow money for the purpose of providing a water supply for Instow. Evidence was given by residents in the district as to the need of a better supply. It was stated that not only was the development of Instow retarded by the inadequacy of the present service, but that in times of drought the inhabitants had difficulty in obtaining water. Two schemes were put before the Inspector. One, proposed by the Barnstaple Water Company, is the subject of an application by them to Parliament, and would necessitate the laying of about six miles of mains; while the other provides for the carrying of water from Northam, on the opposite bank of the River Torridge, where there is a supply in excess of the needs of the inhabitants. Mr. C. E. R. Chanter, the Chairman, and Mr. J. P. Finch represented the Water Company; and Mr. Thornton, who prepared the Northam scheme, explained the proposal. After hearing the evidence, the Inspector visited the Northam Urban District Council's water-works, and next day inspected those of the Water Company.

BELFAST GAS-WORKS EXTENSION.

A Site Recommended.

It may be recalled that for a considerable time past discussion has been rife in Belfast with regard to the most suitable site on which to erect new works to cope with the increasing demand for gas. Ultimately, it was decided to seek the assistance of experts; and Mr. Charles Hunt, of London, and Mr. W. R. Herring, of Edinburgh, were appointed to report upon the matter, with the assistance of two local building experts—Mr. W. H. M'Laughlin and Mr. J. W. Stewart. This they have now done; and their conclusions were laid before the Council in committee last Tuesday, after having been submitted to the Gas Committee earlier the same day. After some discussion, it was resolved—"That the report be received, printed, and circulated among the members of the Council, and that a special meeting of the Council be called for an early date to consider it." Subsequently the report was published *in extenso* in the local Press; and the main portions of it we now reproduce.

The Questions Submitted.

Your Committee were good enough to put before us, for our guidance, certain questions which you desired us to answer, these being—

1.—(*a*) Is any extension of the present gas-works necessary? (*b*) If so, what provision should be made for the future, having regard to the capacity of the existing works, the present rate of increase of consumption, and the possibility of the future development of other undertakings for the supply of light, heat, and power?

2.—What is the smallest area of land that should be acquired for the new works per million cubic feet daily capacity, having regard to local circumstances and economical working? Also, so that comparisons can be made as to the relative values of the different sites, prepare estimates of the following—

3.—The cost of constructing foundations to works level on each site.

4.—The cost of coal-handling plant to each site.

5.—The cost of coal conveyance to each site.

6.—How the income from sales of coke and other residuals will be affected at each site.

7.—How the cost of production of gas will be affected by any other consideration peculiar to some of the sites and not common to the whole.

Answers to the Questions.

We submit our answers to these questions as follows:—

1.—(*a*) Provision for meeting the future demands for gas is now an urgent necessity, in view of the fact that the earliest date on which new works can be brought into operation is the winter of 1914-15, by which time, estimating the increase at only 3¼ per cent. compound (whereas the increase during the past ten years has been 4·25 per cent.), every retort on your present works, including the retort-house under interdict, will be in use, together with all the carburetted water gas to meet the maximum demands of the winter of 1913-14.

We made a careful examination of, and investigation into, the condition and producing capacity of your present works; and it is only right to say that the operations are carried on with very considerable difficulty and some danger, owing to the extremely congested condition of the works, and that the operatives are subjected to conditions which at the present day are looked upon as both unnecessary and undesirable in the operations of gas manufacture.

The congestion has been inevitable owing to the continued extension of the works on the limited area of land available; and your position has been made worse by the interdict which has been granted against the ordinary use of the new retort-house. This retort-house will now have to be used to an increasing extent each winter until additional manufacturing plant is provided elsewhere; and though the arrangement which has been provided for carrying off the smoke from this house seems likely to prove successful, the position can hardly be regarded as satisfactory, because, in the event of the whole of the retorts in the house being used at one time, this cannot but materially add to the general congestion and discomfort of the operatives owing to the limited coke storage ground in its immediate vicinity. Practically speaking, however, its producing capacity will be your only source of additional supply from the present time until new plant can be brought into operation for the winter of 1914-15, because carburetted water gas has been made this winter to the full extent of the plant, though costing, according to last year's accounts, much more than coal gas; and the only other retorts available are a few in the older section of the works, which were recently under repair.

The gasholder accommodation is also much below what is considered safe; being equal to only 57 per cent. (or 6,183,000 cubic feet) of the maximum day's output of 10,699,580 cubic feet (1908). By 1914, it will be only equal to 49 per cent. of the maximum day's output. It would not be possible to carry on the gas supply of Belfast with so little storage, but for the large production of carburetted water gas.

Provision for the Future.

As to (*b*)—What provision should be made for the future, regard being had to "the capacity of the existing works, the present rate of increase of consumption, and the possibility of the future development of other undertakings for the supply of light, heat, and power?—attention may be directed to the increase in the consumption of gas which has taken place since the introduction of electricity, which has been, and continues to be, by far the most important rival to gas. The latest Board of Trade returns, which are for the year 1908-9, show a total gas consumption in the United Kingdom of 173,957 million cubic feet, as compared with only 57,876 million cubic feet in the earliest (1882) returns. In Belfast during the last ten years (1899 to 1909), the consumption, notwithstanding the competition of electricity, has risen from 1306 million cubic feet to 1927 million cubic feet, or 47·68 per cent.; and this corresponds very nearly with the growth of the maximum weekly output, which was 45·7 per cent. in the same period. It is true that electricity shares with gas the favour of the public both for

light and power, and is therefore to a certain extent lessening the rate of increase of gas consumption; but, on the other hand, the comparatively low price at which you are now able to supply gas cannot fail to enable your undertaking to hold its own against either electric light or "power" gas, while additional consumption is to be looked for from the continued increase of population, and the further employment of gas for cooking and heating purposes. As regards the latter, the great success of your recent gas exhibition shows that there is a large and hitherto only partially developed field in this direction. Estimating the future increase at 3½ per cent., the annual output of gas will have reached about 2541 million cubic feet by the earliest time that new works can be completed—namely, 1914, if parliamentary sanction be obtained in 1911—and we are of opinion that within the ensuing fourteen years, or (say) by 1928, an increase of not less than 62 per cent. may with confidence be anticipated. This, on the above output of 2541 million cubic feet, would mean an additional output to be provided for of about 1575 million feet, to which has to be added the extra coal gas (say, 450 millions) that would have to be produced in order to reduce the production of carburetted water gas to 25 per cent. of the total, as determined by your Committee. This brings the total to 2025 million feet, the equivalent of which would be a productive capacity of rather more than 10 million cubic feet per diem, though, as a matter of course, only a portion of this would be immediately required.

It is, moreover, certain that the savings to be effected in the cost of manufacture by the adoption of modern plant would be so great as to render the continuance of the present system undesirable—not to say impossible—for any length of time; and we are strongly of opinion that it will be more advantageous to eventually transfer the whole of the manufacture to a new site than to attempt to modernize the existing works by reconstruction. This should, at all events, be kept in view, though it need not be immediately decided upon. Should such a course be followed, most of the gasholders would remain as at present; but the frontage to Ormeau Road and along the river, being no longer required for gas purposes, would form a valuable asset to set against the cost of a new manufacturing site.

We recommend, therefore, the securing of as large a site as may be available, subject to the conditions being suitable; and that a commencement be made as soon as possible by the provision of works capable of producing not less than 5 million cubic feet per diem of coal gas, and the transfer of 25 per cent. of carburetted water-gas plant; to be increased in coal-gas sections of 5 million feet, with its proportion of carburetted water-gas plant, as required.

2.—From 2 to 2½ acres per million cubic feet daily capacity is the smallest area of land that should be acquired, having regard to the configuration of the site, railway or water facilities, or other circumstances. This is exclusive of what may be required for residual works.

The Eight Suggested Sites.

3.—In conjunction with Messrs. M'Laughlin and Stewart, and accompanied by the City Surveyor and the Gas Engineer (Messrs. Cutler and Sharpe), we made a careful inspection of eight sites available at the present time for gas-works purposes. Of these, however, we consider three to be ineligible—namely, the Bigger estate, because there is no possibility of access to it by either rail or water; the Ormeau Park and Glentoran, because the Glentoran portion is not, in our opinion, suitable for the construction of gasholders; and the Abattoir, because it is much too limited in area to afford more than very temporary relief. The remaining sites under consideration are Ormeau Park, Donegall Road, Cranmore, Twin Island, Brickfields.

We examined very carefully the comparative estimates of values prepared by Messrs. Cutler and Sharpe, and found them to be quite accurate on the basis on which they are made. Our examination, however, of the sites, and the further information we found it necessary to obtain with regard to the subsoil of two of them, have led us in one or two cases to somewhat different conclusions as to cost of excavations and foundations and the quantity of filling-in required. Our modifications are embodied in the revised estimates herewith scheduled, to which, for the sake of convenience, are added all other items of cost incidental to each of the sites. They have been prepared for the requirement of a coal and carburetted water gas plant for a daily production of 13⅓ million cubic feet; the area of land required in each case of necessity varying slightly according to configuration of the site, railway accommodation needed, and other circumstances.

Comparative Expenditure.

Comparative Estimates of Cost of Preparing Sites to Surface Levels for Coal and Carburetted Water Gas Plant, Equal to a Production of 13⅓ Million Cubic Feet per 24 Hours.

—	Ormeau Park.	Donegall Road.	Cranmore.	Twin Island.	Brickfields.
Area required	27 acres	30¾ ac.	30 ac.	32½ ac.	26½ ac.
	£	£	£	£	£
Cost of site	22,060	14,855	4,200	24,375	9,937
Cutting, filling-in, foundations, and embankment, and pitching where necessary	26,632	25,674	37,209	43,253	27,746
Dredging berth, and capitalized cost of keeping same open	*5,000	..	..	..	†5,500
Jetty	3,500	..	..	11,000	3,500
Bridge	10,000	..	..	..	..
Approach and way-leaves	3,000	..	6,390	..	..
Culverting river	—	120	500	..	..
Roads	1,267	..	2,640	..	..
Gas, tar, and water mains	4,090	9,830	13,155	16,570	7,685
Sewers (including capitalized cost of pumping)	..	..	191	1,396	190
	£75,549	£50,479	£64,285	£96,594	£54,558

* Capitalization at 22½ years. † Capitalization at 25 years.

4.—*Cost of Coal-Handling Plant.*—We take this to mean the cost of plant necessary to be provided for delivering coal upon the site.

Ormeau Park	£8,000
Donegall Road	13,000*
Cranmore	13,000*
Twin Island	8,000
Brickfields	8,000

* Includes locomotives and rails.

5.—We give below the cost per ton of coal delivery on to the site, exclusive of sea freight: Ormeau Park, 11d.; Donegall Road, 1s. 3½d.; Cranmore, 1s. 3½d.; Twin Island, 2½d.; Brickfields, 12d. As regards Twin Island, a saving is anticipated in sea freight, as compared with the other sites, of from 1½d. to 3d. per ton, owing to the possibility of prompter discharge. It should also be possible, with the facilities that will have to be provided, to reduce the cost of unloading such coal as may be required for the existing works.

6. *Tar.*—Each of the sites under consideration would be at a disadvantage as regards the disposal of tar, since this would have to be conveyed to the distillery adjoining the existing works. For the purpose of expressing this disadvantage, we have included under the head of "Cost of gas, tar, and water mains," the cost of a pipe from each site to convey the tar to the existing distillery.

Ammonia.—We assume that a sulphate of ammonia plant will form a part of the new gas-works, wherever erected, in which case a substantial addition to the revenue from ammonia may be anticipated. The Twin Island site offers exceptional advantages in this respect, since sulphate of ammonia could be shipped from there to the principal markets abroad, without cost for rail or river carriage.

Coke.—The intended reduction of the proportion of carburetted water gas to be produced when the new gas-works are brought into operation will increase the quantity of coke made for sale, and will in all probability result in a reduction of its selling price. The loss from this, however, can hardly be greater—and will probably be less—than that which is at present incurred by the excess cost of carburetted water gas; and, apart from it, we see no reason to apprehend loss in the disposal of coke from any of the sites under consideration. All the sites—with the exception of Ormeau Park—are at a greater distance from the centre of the city than the existing works; but experience has shown in similar cases that such new conditions are hardly less favourable than the old, and may become more favourable by the opening up of additional markets.

7.—There does not appear to us to be any consideration, other than such as have been dealt with in our previous answers, peculiar to some of the sites and not common to the whole, by which the cost of production of gas would be affected; but we may point out that the Twin Island site would offer exceptional economy as regards delivery of constructional materials for the building of works.

General Considerations.

The initial capital outlay required at each site varies from highest to lowest to the extent of £46,115; but such a variation is of little moment in comparison with the possibility of saving in the cost of coal conveyance. Were it not for the disadvantage under which it labours in this respect, and for its somewhat limited area, the Ormeau Park site would, in our estimation, stand first in the list of sites—its proximity to the existing works being a decided advantage. At the same time, it must be admitted that its selection for gas-works purposes, in view of its surroundings, would be somewhat difficult to justify before a Parliamentary Committee, having regard to the alternative sites at your disposal.

Taking the difference in cost of coal delivery between this and the Twin Island site at 8½d. per ton, the adoption of the latter would mean a saving in the first year of fully £4250—sufficient to pay interest and sinking fund of 5 per cent. on an excess expenditure of £85,000; whereas only £21,045 would be required compared with Ormeau Park, or £39,670 if the whole cost of the Twin Island site be included.

This estimate of saving is based on the assumption that advantage would be taken of the immediate provision of a 5 million cubic feet coal-gas plant to work this on completion to its fullest extent, as far as the consumption may admit, in preference to keeping on the old works during the summer months, in which case from 120,000 to 130,000 tons would be carbonized at the new works during the first year. When the second 5 million cubic feet coal-gas plant is brought into operation, the saving in cost of coal conveyance should exceed the above figure by at least 50 per cent.

The comparison would be still more favourable to Twin Island if made with any of the other sites under consideration, because the cost of coal conveyance is greater to these sites than to the Ormeau Park site. In our opinion, the Gas Committee are very fortunate in having at their disposal a site so eminently suitable for gas-works purposes, and at the same time so free from liability to objection as the one at Twin Island. We have given very careful consideration, to the only difficulty to be apprehended in connection with this site—namely, that of foundations; but full provision has been made for this in our estimates, and, accordingly, we have no hesitation in recommending its adoption.

We have already shown that the saving in the cost of delivering the coal to the Twin Island site will be sufficient during the first year of operation to pay interest and sinking fund charges upon the entire capital involved in the purchase of the site and the provision of foundations for the plant and appliances. We may further say that, in our opinion, the saving that can be brought about in the cost of manufacture by a well-planned works, fitted with modern appliances, will also be sufficient to pay the interest and sinking fund charges on the constructional work it is suggested should be established upon the site.

Southampton Corporation and the South Hants Water Company's Bill.—At the meeting of the Southampton Town Council last Wednesday, it was decided, on the recommendation of the Parliamentary Committee, who presented a voluminous report on the subject, to oppose the Bill of which notice has been given by the South Hants Water Company, and to take steps, at the earliest practicable opportunity, to obtain power to purchase the Company's undertaking.

POSITION OF THE METROPOLITAN WATER BOARD.

Possible Levy of a Deficiency Rate.

At the Meeting of the London County Council to-day, the Local Government Records and Museums Committee will submit the following report on the finances of the Metropolitan Water Board.

With regard to certain questions which have recently been put at meetings of the Council as to an alleged deficiency on the revenue and capital accounts of the Metropolitan Water Board, and the possibility of a deficiency rate being levied, we are giving careful consideration to the whole subject from the point of view of the possible effect on London rating.

The present position appears to be that the Metropolitan Water Board's accounts showed a deficiency of £25,280 in 1908-9, and that the estimates for 1909-10 showed a further deficiency of £75,400; and the possibility that the estimates for 1910-11 may show another deficit makes it necessary that the position so disclosed should receive the attention of the Council, as the principal rate-raising authority and also as a large ratepayer, in regard to its effect upon local rating and local taxation generally in London.

By section 15 of the Metropolis Water Act, 1902, the Board are empowered to levy a rate to meet any deficiency in its revenue. The deficiency would first be apportioned among the districts represented on the Board according to the rateable value of all premises supplied with water, whether for domestic, trade, or any other purposes. The amount so apportioned between the districts would be raised as rate in the usual way. This would give rise to many difficulties and anomalies. The incidence of a deficiency rate would necessarily differ considerably from that of the charges for water supplied. Incidentally, it would fall upon most ratepayers who are not water consumers, while certain others who are water consumers would escape from it. But what is of great importance from the London point of view is that, while the existing charges for water unduly favour extra-London districts at the expense of London, the levy of a deficiency rate would accentuate the present inequalities, as an even greater proportion of the new burden would have to be borne by the London ratepayers.

The Metropolitan Water Board has not yet resorted to such a rate, but it is evidently fully alive to the financial position with which it is confronted. It has decided, since the matter was referred to us, to institute an inquiry into the whole subject. On Jan. 28, 1910, the Board instructed its Finance Committee to prepare and submit a full report on the financial position of the Board, comparing the position of the undertaking at the present time with that of the late Metropolitan Water Companies; and before reporting fully upon the matter, we propose to await the issue of that report.

There are, however, certain features of the case which have an important bearing on the question of the need for levying a deficiency rate, but with which the Metropolitan Water Board may perhaps not deal, except at the instance of the Council, or unless further statutory powers are conferred upon the Board. We refer particularly to the inadequate contribution to the revenue of the Board which is made by the extra-London districts. It appears that London contributes to the domestic water-rate of the Board at least 50 per cent. per head of population more than the outside districts, involving a very large additional burden upon London. Though we do not suggest that population is a suitable basis for water charges, this fact is some indication of the prejudicial effect upon London of the existing basis of charge for domestic supply.

The basis of charge is not arrived at under the same law in London and the outside areas. The Valuation (Metropolis) Act, 1869, provides for quinquennial revaluation of all the properties in London. As an example of the importance of this revaluation to the Metropolitan Water Board, we may mention that the last quinquennial revaluation in London had the effect of increasing the Board's income by about £55,000 (less losses on collection), without any increase in expenditure. Outside London there is no regular revaluation of properties, and consequently no guarantee that the standard of assessment is kept up to date; nor is there any periodical increase of revenue from this cause. At the time of the passing of the Metropolis Water Act, 1902, it was estimated that the rateable value of premises for poor law purposes in extra-London was, on an average, 15 per cent. lower than the London standard. Before the Metropolitan Water Board (Charges) Act, 1907, the Board had power itself outside London to fix the basis on which it should charge. By that Act it was deprived of the power, and the immediate loss of revenue amounted to £26,800. The ultimate loss was more than this; and there seems little doubt that, if the standard of assessment were the same in extra-London as within London, the Board's revenue would benefit to the extent of between £40,000 and £50,000 a year. Such an additional income would have gone far to ease the financial position.

Having regard to these facts, we are of opinion that, before resorting to any remedy such as the levy of a deficiency rate, which would still further increase London's proportion of water charges, effective measures should be taken to render those charges more uniform and equitable in their incidence. The Council has already taken some steps to bring this matter to the notice of the Metropolitan Water Board. In 1907 it suggested that, pending an amendment of the law of valuation, the Board should use such powers as it possessed to bring about equality of valuation between London and extra-London; but, so far as we are aware, nothing has been done in the matter.

We suggest that the Metropolitan Water Board should be approached again on the subject, and urged to consider seriously these aspects of the case in connection with the investigation which it is about to undertake. We recommend—(*a*) That in the opinion of the Council the investigation about to be undertaken by the Metropolitan Water Board as to its financial position should include inquiry into the effect on income of the use, as the basis of charge for domestic supplies, of rateable value determined according to two different standards of valuation respectively for London and the other districts within the Board's area. (*b*) That the foregoing resolution be communicated to the Metropolitan Water Board.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The explosion in the Coatbridge Gas Company's works, mentioned in another column of the "JOURNAL," is a disappointing one; and to none will it be more so than to Mr. T. Wilson, the Manager of the works. I understand that such a complete wreck as there has been of the purifier-house has never been witnessed by anyone who has seen this one. In considering the matter of this explosion, it is not to be forgotten that the whole of the Coatbridge district is honeycombed with underground coal, iron, and clay workings, and that stability in any structure upon the surface of the ground is scarcely to be looked for. Only a year or two ago, Mr. Wilson stated, at a meeting of gas managers, that he never required to pump a street syphon. Bad as the accident has been, in the destruction of material, it is a satisfaction to know that the supply of gas to the town was not interrupted. The Directors at once made temporary arrangements for the purification of the gas; and they are already moving in the matter of having the purifiers re-erected.

The Gas Committee of the Dundee Town Council on Monday considered the clauses of their proposed Provisional Order, by which it is desired to secure additional borrowing powers, rearrange the sinking fund, create debenture stock, make consumers liable for the money in prepayment meters, protect gas appliances hired out from the landlords' hypothec, get power to lay pipes in streets not dedicated to public use, and to secure powers in connection with several other matters. The Town Clerk said that these matters were non-controversial. Another question had been mentioned, which was the possibility of getting a contribution from the gas undertaking towards the relief of the rates; but it was thought that this might be taken up when the estimates for lighting were being framed. Mr. Mechan asked if the gas undertaking could not make a contribution to the Common Good. The Town Clerk replied that he did not know if this could be done; but the rates were liable for the gas undertaking. Treasurer Soutar said this was a non-controversial Order, to be carried through without opposition. Its main purpose was to increase the borrowing powers; but certain *quasi*-financial matters had been put in. To get a payment by the Gas Department to the Common Good was far too big a question to be incorporated in the Order. The matter was allowed to drop; the suggested clauses being generally approved. Next day, in a column of specially contributed articles which are published from time to time in the "Dundee Advertiser," there was one which stated that, on the face of it, it seemed a reasonable proposal that the Gas Department, now that it was in a flourishing condition, should make a contribution to the Common Good. The rates, in the last resort, were responsible for the gas undertaking; and this might justly be held to involve a reciprocal obligation on the part of the Gas Department to help the rates. The Common Good certainly needed some assistance. The account was considerably overdrawn, and there did not seem much chance of it being squared in the ordinary way. But evidently there were difficulties to be met, and the Town Council were not prepared for controversy in this matter. If the gas affair were to get into a bad condition, there would be no controversy about the rates having to help; but evidently there was to be when it was in a position to give aid to another department, when that other department was in trouble.

Last Tuesday, in the Hamilton Town Council, the Gas Committee reported that complaint had been made to them by residents in the neighbourhood as to a nuisance caused by smoke and dust from the gas-works, and that claims were intimated by two occupiers for damage done to clothing on their bleaching greens. The Committee instructed the Town Clerk to reply repudiating liability, and intimating that everything possible was being done to avoid complaints. There was a discussion in the Council upon this report; and the subject was sent back to the Committee for further consideration.

A new Manager for the Sanquhar Gas-Works entered upon his duties on Dec. 18 last; and at a meeting of the Town Council the other day it was reported by the Gas Committee that from that day down to Jan. 3 there had been an average yield of gas of 8120 cubic feet per ton of coal carbonized, as compared with 7120 cubic feet in the corresponding period—an increase of 1000 cubic feet per ton of coal, which was considered very satisfactory.

The Corporation of Dumfries this week let the contract for the building of a new retort-bench, with the ironwork, stage floors, coal breaking and handling plant, and charging and discharging machinery, including motive power, and also the roofs for the retort-house and coal-stores, to Messrs. Robert Dempster and Sons, Limited, of Elland, at the price of £11,600.

The annual dinner of the employees in the Distribution and Fittings Departments of the Edinburgh and Leith Gas Commission was held in Milne's Hotel, Edinburgh, last night—Mr. W. R. Herring, the Engineer, in the chair. The company numbered about ninety. The toast of "The Edinburgh and Leith Corporations Gas Commissioners" was proposed by the Chairman, and responded to by Judge Inches. Judge Bryson proposed "The Distribution and Fittings Departments," for the former of which Mr. A. Masterton responded, and for the latter Mr. J. S. Miller.

In connection with the gas transfer which is in progress at Fraserburgh, a special meeting of the Town Council was held yesterday, at which Provost Finlayson intimated that a remonstrance signed by 21 ratepayers had been lodged against the resolution of the Council to adopt the Burghs Gas Supply Act. This would necessitate their going through the procedure of taking a poll by plebiscite. If a requisition were made to him, he would call a special meeting for the purpose of explaining to the public the object of the Council's resolution.

The purifying plant in the Peterhead Gas-Works is at present being very largely extended. The last extension was effected in 1886, when the annual output of gas was under 16 million cubic feet. The plant then installed was capable of dealing with 166,000 cubic feet per 24 hours. During the present winter it has been necessary, on some days, to force as much as 250,000 cubic feet through. The need for extension was thus clamant. To enable it to be effected, the Corporation bought adjoining properties, consisting of a row of shops and dwelling

houses, a fish-curing yard, and stables, at a total cost of £1210. The tenement is to be remodelled; the dwelling-houses being intended as residences for Corporation servants. As the output of gas in the current year is anticipated to be about 52 million cubic feet, it is obvious that a very great increase in purifying capacity was required. The plant—designed by Mr. W. Ritchie, the Manager—consists of four boxes with two tiers of grids; the lower tier bearing oxide of iron and the upper one lime. The capacity will be equal to 750,000 cubic feet per day. The Contractors are Messrs. Henry Balfour and Co., Limited, of Leven, Fifeshire; and the cost will be £1199. The existing plant is to be retained for use in summer. Since Mr. Ritchie was appointed Manager at Peterhead, four years ago, the consumption of gas has been greatly extended, owing to the vigorous manner in which the use of gas cooking and heating apparatus has been pushed; and it is gratifying to know that within the past three years the price of gas has been reduced by 6d. per 1000 cubic feet.

After a lapse of twenty-five years, the reunion of the employees in the Dundee Corporation Gas Department was resumed last night. Mr. A. Yuill, the Engineer, presided over a large attendance in the Kinnaird Hall. He explained that in 1885 the annual make of gas was 390 million cubic feet, and that it was now 875 millions; while the price had declined from 3s. 6d., with meter-rent equal to 2d. more, to 2s. 3d. per 1000 cubic feet. The capital per million cubic feet had declined from £900 to £433; while now cookers and all cooking appliances were given on loan free, and gas-fires were hired on reasonable terms. In 1885, the coke made amounted to 11,500 tons; it was now 56,500 tons a year. In regard to public lighting, there were no statistics available so far as 1885 was concerned; but between 1901 and 1909, the cost of public lighting had diminished from £9097 to £8871, while the lighting power had gone up from 50,000 to 220,000 candles. In the twenty-five years the number of employees had risen from 287 to 350, and the weekly wages bill from £335 to £513. The average weekly wage in the year 1885 was 22s. 6d.; and it was now 29s. 4d. Considering the great reduction in the price of gas, and the generally excellent condition of the works, he did not think consumers would grudge the employees that increase. Ex-Bailie High, the Convener of the Gas Committee, also addressed the meeting. An excellent musical programme was gone through.

Progress of Chard Gas Undertaking.—Explaining the borough accounts for the past year to the members of the Chard Town Council, Mr. C. F. Spencer, the Accountant, remarked that, as gas-works arbitrations were now-a-days, the Council's policy in purchasing the gas undertaking was amply justified. It had been suggested that the Council paid too much for the works; but if they took the profits which had accrued since the purchase in 1905, and compared them with those of the last few years of the old Gas Company, they would see how amazingly the Corporation had increased them. They had augmented the sale of gas and reduced the leakage, while production cost the old Company nearly 1s. per 1000 cubic feet more than it was costing the Corporation. He found that in 21 towns of about Chard's size, Chard stood fifth as regarded rates; while with regard to debt, Chard stood fourth. He congratulated the Council on the really excellent financial position the borough was in.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 12.

Sulphate of Ammonia.

The week opened with a dull tone; but in the latter half there has been improved demand, occasioned by the fact of dealers covering their February requirements, and some further direct orders from consumers abroad coming on the market. Although the home trade is still a negligible quantity, the position has become very firm again; and the nearest values at the close are £11 13s. 9d. per ton f.o.b. Hull, £11 15s. to £11 16s. 3d. per ton f.o.b. Liverpool, and £11 17s. 6d. per ton f.o.b. Leith. For March and April delivery, £11 16s. 3d. per ton f.o.b. Leith is reported as having been paid; but although makers are willing to make some concession for May and June, buyers still hold aloof for these later months. It has also transpired that there are sellers for July-December shipment at £11 12s. 6d. per ton f.o.b. at the best ports without finding an outlet.

Nitrate of Soda.

On increased business, quotations have been advanced to 9s. 3d. per cwt. for ordinary and 9s. 6d. for refined quality, on spot.

LONDON, *Feb.* 14.

Tar Products.

The markets for tar products have been steady throughout the past week. Pitch maintains its price, and some quantity has been sold on the west coast at 31s. 6d. f.o.b.; while at ports on the east coast, where there is a very favourable rate, even better prices have been paid. Some quantity was sold in London at 31s. Creosote remains steady and well sold in London, and this is also the case in the Midlands while in the North the market is still dull. Benzol, 90 per cent., is in good demand for prompt delivery both in London and the North. Fifty-ninety per cent. benzol is scarce; but at present buyers will not pay the price asked. Toluol is in good demand. Solvent naphtha is very firm indeed both in London and the North. Heavy naphtha is quiet, and there is not much business doing. Carbolic acid is steady; but consumers appear disinclined to pay the prices asked by makers. Tar is fetching good figures.

The average values during the week were: Tar, 15s. 6d. to 19s. 6d. *ex* works. Pitch, London, 31s. to 31s. 6d.; east coast, 31s. to 31s. 6d.; west coast, 30s. to 31s. f.a.s. Mersey ports, 30s. f.o.b. others. Benzol, 90 per cent., casks included, London, 7¼d.; North, 6¾d.; 50-90 per cent., casks included, London, 7¾d. to 8d.; North, 7½d. to 7¾d. Toluol, casks included, London, 10d.; North, 9½d. Crude naphtha, in bulk, London, 4d. to 4¼d.; North, 4d. to 4¼d.; solvent naphtha, casks included, London, 1s. 2d. to 1s. 3d.; North, 1s. 1½d. to 1s. 2½d.; heavy naphtha, casks included, London, 11½d. to 1s.; North, 10½d. to 11d. Creosote, in bulk, London, 2⅝d. to 2¾d.; North, 2½d. to 2⅝d. Heavy oils, in bulk, 2¾d. Carbolic acid, 60 per cent., casks included, east and west coasts, 1s. Refined naphthalene, £4 10s. to £8 10s.; salts, 45s., bags included. Anthracene, "A" quality, 1¼d. to 1⅜d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article has been steady during the past week. In London, the principal Gas Companies quote £11 17s. 6d. to £11 18s. 9d.; while outside makes upon Beckton terms remain about £11 8s. 9d., and f.a.s.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 412.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,474,000	Stk.	Oct 14	5	Alliance & Dublin Ord.	86 88	..	5 13 8
310,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	98—100	..	4 0 0
200,000	5	Oct. 28	6¼	Bombay, Ltd.	6—6½	+⅛	5 4 0
40,000	5	,,	6¼	Do. New, £4 paid	4⅝—4¾	..	5 6 8
50,000	10	Aug. 26	15	Bourne-) '09 p.c.	29½—30½	+1½	4 18 4
311,810	10	,,	7	mouth Gas) B 7 p.c.	10⅝—17½	+⅛	4 1 2
75,000	10	,,	6	and Water) Pref. 6 p.c.	15⅝—15⅞	..	3 16 2
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	256—259	+2	4 16 6
300,000	,,	,,	9¾	Do. New	192—194	..	4 17 11
50,000	,,	,,	5	Do. 5 p.c. Pref.	120—122	..	4 2 0
206,250	,,	Dec. 29	4	Do. 4 p.c. Deb.	101—103	+2	3 17 8
220,000	Stk.	Sep. 10	11	Brighton & Hove Orig.	218 - 221	..	4 19 7
246,320	,,	,,	8	Do. A Ord. Stk.	154—157	..	5 1 11
460,000	20	Oct. 14	10	British	42⅛—43⅛	..	4 11 11
109,000	Stk.	Aug. 26	6	Bromley, A 5 p.c.	119—121	..	4 19 2
165,700	,,	,,	4½	Do. B 3½ p.c.	89—91	..	4 18 11
82,278	,,	,,	5⅛	Do. C 5 p.c.	106—108	..	5 1 10
55,000	,,	Dec. 29	3½	Do. 3½ p.c. Deb.	87—89	..	3 18 8
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	14⅛—14⅜	..	4 14 11
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	98—100	..	4 0 0
100,000	10	—	—	Cape Town & Dis., Ltd.	3—4	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	5⅛—5⅜	..	—
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	48—49	..	6 2 6
100,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	80—82	..	5 9 9
157 150	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	108½—110½	..	4 10 6
1,493,280	Stk.	Aug. 26	5⅛	Commercial 4 p.c. Stk.	109—111	..	4 13 8
560,000	,,	,,	5	Do. 3½ p.c. do.	105—107	..	4 13 6
475,000	,,	Dec. 29	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800 000	Stk.	Dec. 10	5	Continental Union, Ltd.	95—97	..	5 3 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	137—139	..	5 0 9
492,270	Stk.	—	5	Derby Con. Stk.	121—123	..	4 1 4
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
148,995	,,	Oct. 2	5	East Hull 5 p.c. Ord.	98—100	..	5 0 0
486,093	10	Jan. 27	12	European, Ltd.	24—24½	..	4 18 0
354,060	10	,,	12	Do. £7 10s. paid.	18½—18¾	..	4 16 0
15,141,545	Stk.	Feb. 10	4⅝	Gas) 4 p.c. Ord.	103½—104¾*	+⅜	4 9 3
2,603,000	,,	,,	3½	light) 3½ p.c. max.	87—89*	..	3 18 8
3,799,735	,,	,,	4	and) 4 p.c. Con. Pref.	102—104*	..	3 16 11
4,193,975	,,	Dec. 29	3	Coke) 3 p.c. Con. Deb.	81—83	..	3 12 3
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.	95—97	..	5 3 1
82,500	,,	,,	6½	Do. do. 5 p.c.	119—121	..	5 7 5
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	17½—18	..	6 2 3
131,070	Stk.	Sep. 10	6½	Ilford A and C	145—147	+1	4 8 5
65,783	,,	,,	5	Do. B	108—110	..	4 10 11
65,500	,,	Dec. 29	4	Do. 4 p.c. Deb.	100—102	..	3 18 5

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
4,940,000	Stk.	Nov. 11	8	Imperial Continental	175—177	..	4 10 5
1,235,000	Stk.	Feb 10	3½	Do. 3½ p.c. Deb. Red.	92—94*	..	3 14 6
195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	120—122	..	4 18 4
561,000	Stk.	,,	10	Liverpool United A.	227—229	..	4 7 4
718,100	,,	,,	7	Do. B	16—167	..	4 2 10
306,083	,,	Dec. 29	4	Do. Deb. Stk.	103—105	..	3 16 2
75,000	5	Nov. 26	6	Malta & Mediterranean	4⅜—5	..	6 0 0
560,000	100	Oct. 1	5	Met. of) 5 p.c. Deb	99—102	..	4 18 0
250,000	100	,,	4½	Melbourne) 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 11	3¾	Monte Video, Ltd.	12⅞—13⅛	..	5 5 8
1,775,892	Stk.	July 29	4⅜†	Newc'tle & G'tesh'd Con	107⅛—108½	..	4 0 8
529,435	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.	91—93	..	3 15 3
55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13—13⅜	..	5 3 8
300,000	Stk.	Nov. 26	8	Oriental, Ltd.	138—140	+1	5 14 4
60,000	5	Sep. 10	8	Ottoman, Ltd.	6⅛—6⅜	..	6 5 6
31,800	53	Aug. 26	13	Portsea Island A.	137—139	..	4 19 0
60,000	50	,,	13	Do. B.	129—131	..	4 19 3
100,000	50	,,	12	Do. C.	122—124	..	4 16 9
114,800	50	,,	10	Do. D and E.	102—104	..	4 16 2
398,490	5	Oct. 28	7	Primitiva Ord.	7⅛—7⅜	..	4 14 11
796,980	5	Jan. 27	5	Do. 5 p.c Pref.	5⅛—5⅜	..	4 10 11
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	98—100	..	4 0 0
1,000,000	10	Oct. 14	8	River Plate Ord.	17¼—17⅜	+⅛	4 10 2
312,650	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	99—101	..	3 19 3
250,000	10	Sep. 29	8	San Paulo, Ltd.	14⅜—15⅛	..	5 4 11
62,500	10	,,	6	Do. 6 p.c. Pref.	11¼—12⅛	..	4 18 0
125,000	50	Jan. 3	5	Do. 5 p.c. Deb.	50—51	..	4 18 0
135,000	Stk.	Sep. 10	10	Sheffield A	233—235	..	4 5 1
269,984	,,	,,	10	Do. B	233—235	..	4 5 1
523,560	,,	,,	10	Do. C	233—235	..	4 5 1
70,000	10	Oct. 14	10	South African	12⅛—12⅜	..	7 16 11
6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	119—121*	+⅜	4 10 4
1,895,445	,,	Jan. 13	3	Do. 3 p.c. Deb.	82—84	+1	3 11 4
209,820	Stk.	Aug. 26	8	South Shields Con. Stk.	160—162	..	4 18 9
605,000	Stk.	Aug. 12	5⅜†	S'th Suburb'n Ord. 5 p.c.	122—124	+2	4 11 3
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—122	..	4 2 0
117,058	,,	Jan. 13	5	Do. 5 p.c. Deb. Stk.	120—122	..	4 2 0
502,310	Stk.	Nov. 11	5	Southampton Ord.	110—112	..	4 9 3
120,000	Stk.	Feb. 10	6⅜	Tottenham) A 5 p.c.	133—135*	+1⅛	5 1 9
453,940	,,	,,	5⅜	and) B 3½ p.c.	110—112*	+1⅛	4 15 11
149,470	,,	Dec. 29	4	Edmonton) 4 p.c. Deb.	98—100	..	4 0 0
182,380	10	Dec. 29	8	Tuscan, Ltd.	9¼—9⅝	..	8 4 2
149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p c max.	112—114	..	4 7 9
255,636	Stk.	Aug. 26	6⅝	Wands-) B 3½ p.c.	142—144	..	4 12 0
79,416	,,	Dec. 29	3	worth) 3p.c. Deb. Stk.	74—76	..	3 18 11

Prices marked * are "Ex div." † Next dividend will be at this rate.

London £11 8s. 9d. to £11 10s. In Hull, business has been done for inferior makes at £11 12s. 6d., and best makes have been declined at the same figure. In Liverpool, £11 15s. to £11 16s. 3d. is asked, and in Leith £11 16s. 3d. to £11 17s. 6d. In Middlesbrough, £11 17s. 6d. is quoted, and business has been done for prompt delivery at £11 16s. 6d. The market closed firm, and inquiries are good for prompt delivery.

COAL TRADE REPORTS.

Northern Coal Trade.

There is now a fuller supply both of gas and steam coals; and this has made the prices for some classes of coal easier. In steam coals, the output has been good, and the rather limited arrivals of steamers have made the market quiet. Best Northumbrian steams are from 11s. to 11s. 3d. per ton f.o.b.; second-class steams are from 10s.; and for steam smalls, from 5s. 6d. to 6s. 6d. is now quoted—the output of the latter class being more ample. In the gas coal trade, more of the pits have been at work in the last few days, and thus some of the arrears of delivery are being made up. Prices are a little quieter in consequence; and Durham gas coals may be quoted from 10s. 6d. to 11s. 6d. per ton f.o.b. for the usual classes, according to quality. For "Wear" specials, up to 12s. is quoted. There has been very little of late done in contracting for forward supplies, owing to the unpromising prospect that the trade had before it; but now that there is at all events more settlement, it is expected that some of the orders will soon come into the market. At the same time, higher freights may make the quotations for coal more, so that contracts will not be quite so easy to conclude as they were a few months ago—a statement that is especially applicable to best gas coal. Coke is firm; and good gas coke is from 13s. 6d. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

The coal market shows no change, except that ell for shipment is in better demand. Other sorts are in request, but prices are unaltered. Quotations are now: Ell, 9s. 9d. to 10s. 6d. per ton f.o.b. Glasgow; splint, 10s. 9d. to 11s.; and steam, 9s. 6d. to 9s. 9d. The shipments for the week amounted to 303,754 tons—a decrease of 1383 tons upon the preceding week, but an increase of 63,857 tons upon the corresponding week of last year. For the year to date, the total shipments have been 1,324,385 tons—an increase of 241,106 tons upon the corresponding period.

Serious Leakage at the Walshaw Dean Reservoir.—At their last monthly meeting, the Halifax Town Council sat in Committee to authorize the Water Committee to carry out certain works recommended by the Engineers to remedy the leakage at the Walshaw Dean reservoir. These works are to sink a trench alongside the puddle trench of the embankment, to ascertain what clay has been washed away, and to fill up the cavities found with concrete. The possible cost, it was stated, might be £40,000. Authority for the work was given.

Pontefract Water Supply.—The Pontefract Town Council have decided to spend £2200 in making another borehole at the Roall Water-Works, and in deepening those already existing. It was stated at the meeting that they were "on the eve of a crisis," and unless immediate steps were taken a serious stoppage in the supply might occur. The numerous frost bursts a week ago actually caused a stoppage in the higher parts of the town. The Committee had gone carefully into the matter, and proposed this scheme, which would render unnecessary any large expenditure at Roall for a long time to come.

Penistone District Council and the Gas-Works.—The proposed purchase of the undertaking of the Penistone, Thurlstone, and Oxspring Gas Company by the Penistone Urban District Council has aroused considerable interest throughout the district; and on Friday the Thurlstone Urban District Council held a special meeting to discuss the question. The Penistone Council are asking the Thurlstone Council not to oppose their application to Parliament for an Act to empower them to purchase; and the terms on which the latter authority would consent to this were considered at some length. The Clerk presented a draft agreement, and it was unanimously decided to forward it to the Penistone Council.

Co-Partnership in the Walker and Wallsend Gas Company.—At the annual general meeting of the Walker and Wallsend Union Gas Company last Friday, the Chairman (Mr. C. J. Potter), in moving the adoption of the report, which was noticed in the "JOURNAL" a fortnight ago, said the revenue account for last year resulted in a gross profit of £11,923, which showed an increase of £229, and the profits were the largest on record. Referring to the co-partnership scheme, he said the bonus to the employees to be invested in the Company's stock amounted to £354. The employees of all grades were quite contented; and the advantages of the system appeared to be fully recognized by the Directors, officials and workmen alike. The report was adopted.

Well-Deserved Recognition.—The Southend Water Company are promoting a Bill to extend slightly the limits of supply, to sanction and confirm the construction of certain existing works, to authorize the construction of new works, to raise additional capital, and for other purposes. In due course the draft was considered by the Law and Parliamentary Committee of the Town Council, who suggested certain amendments, and recommended the Council to oppose the measure. When the report containing this recommendation came before the Council, Alderman Brightwell said there would be no necessity to oppose the Company in Parliament. The Council would be able to come to satisfactory terms long before the parliamentary stage was reached. Alderman Francis said they had been given no information on the subject, and would, therefore, be voting in the dark. To this, Alderman Brightwell replied: "Well, all I can say is that the Company having served the borough so thoroughly well in the past, the Council are not disposed to hamper them in any way. But it has been suggested that, if we want any concessions, now is our time. There may be minor questions which will crop up; but we do not anticipate anything whatever of a serious nature." The report was adopted.

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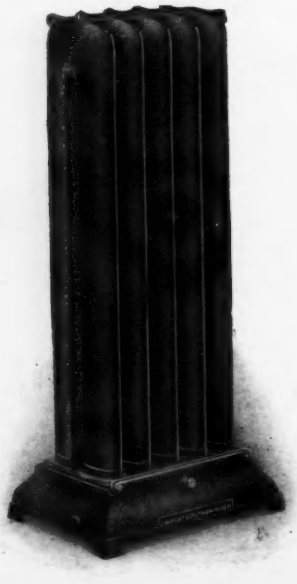
The "Official" Flue Radiator.



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The "Official" is constructed by Experts in Radiator Manufacture, and embodies the results of over 40 years' experience in Radiator Construction.

JOHN WRIGHT & CO.,
The Radiator Experts,
Essex Works, BIRMINGHAM.

227.

Pontefract Corporation Finances.

There was held yesterday week an adjourned special meeting of the Pontefract Town Council, to receive the reply of the Borough Accountants (Messrs. Lowden and Gibson) to criticisms which have recently been passed, and further to consider the position and conduct of the gas undertaking. The statement of the Accountants showed that in connection with the gas-works about 36 books were kept; and no complaint as to inadequacy had been made by the professional Auditors, except lately as to the want of a proper "stores account." The Elective Auditor also made no suggestion; and the usual Government returns were always readily prepared. As to the system of audit, each accounting officer of the Corporation had always been held personally responsible to the professional Auditors; and the Accountants had not considered it part of their duty to check the details of slot-meter consumption, the register of which was kept at the gas-works by a clerk, under the direct control of the Manager. Mr. Archer, after criticizing these observations in a long speech, proposed the adoption of the recommendations of the Gas Committee that a gas expert be called in to examine the works and report, and an expert accountant to establish a satisfactory system of book-keeping. The motion was seconded by Alderman Grandidge, and carried; the only opponent being Alderman Wordsworth, who claimed that the expense was unnecessary. Mr. Archer next moved that a Borough Accountant should be appointed to devote his whole time to the service of the Corporation, and that the Finance Committee be instructed to take steps to give effect to this resolution. Alderman Wordsworth seconded the motion, which was carried practically without discussion.

Gas Supply of St. Etienne (Loire).—The Municipal Council of St. Etienne, in the department of the Loire, have decided to carry on, as from Jan. 1, 1911, the gas supply of the town through the medium of a concessionary—the Council retaining a financial interest in the undertaking. St. Etienne is a town of about 146,000 inhabitants, situated in the centre of a coal field some 32 miles south-west of Lyons; and it is one of the places included in the group served by MM. P. de Lachomette et Villiers.

Witney Gas Company, Limited.—The half-yearly meeting of this Company has just been held, and the report of the Managing-Director (Mr. Arthur L. Leigh) showed a very satisfactory result. The coal carbonized was 588 tons, the gas made 7,144,000 cubic feet, the gas sold 6,584,000 cubic feet, and the unaccounted-for gas 560,000 cubic feet, or 7·8 per cent. The gas made per ton of coal was 12,150 cubic feet, and the gas sold 11,200 cubic feet. As a result of this, the balance-sheet showed by far the largest profit earned in any half year. The increase in the sales of gas over 1908 was 5·7 per cent. During the six months, a Parkinson and Cowan retort-house governor and a non-seal arrangement in the hydraulic main were in use, in addition to other improvements in the method of working, including one of Mr. Frank Leigh's patent automatic pressure-changers for the station governor—see p. 442.

Barry Gas-Works Extension.—On the 2nd inst., Mr. M. K. North, Local Government Board Inspector, held an inquiry respecting the application of the Barry Urban District Council to borrow £2200 for extensions at the gas-works, and £5000 for fittings, meters, &c. It was stated by Mr. T. E. Franklin, the Gas Engineer and Manager, that he estimated a profit of £400 per annum as the result of installing a sulphate plant. The steam-boilers wanted renewing; the present boilers having been in use since the concern was taken over in January, 1894. The Council also asked, in regard to the amount sought to be borrowed for fittings, that the repayments should extend over a period of fifteen years, not ten as hitherto—this period being too short.

Improved Public Lighting of Sabden, near Blackburn.—The scheme of the Sabden Parish Council for the lighting of the streets was brought into operation last Friday evening. The gas is supplied by the Padiham Urban District Council; and the work of carrying the gas over the Black Hill—a distance of three miles—and erecting and fitting up the lamps has been carried out by Mr. A. J. Harrison, the Gas Engineer and Manager to the Council. More than seventy years ago, the main street of the village was illuminated with coal gas; and Sabden had the distinction of being the first village to be so lighted in Lancashire, if not in England. The lighting at that time was carried out by the old Calico Printing Company, and was done for their own convenience, to facilitate communication between the various parts of their works, which at that time ran night and day. Many years ago, however, the firm ceased street lighting, and since then the Parish Council have tried oil-lamps and acetylene lamps, but with only moderate success. The present scheme, by which the streets are illuminated with the most improved type of incandescent gas-lamp, is very successful; and it has been hailed with satisfaction by the entire village community.

Quality of Southport Gas.—At the meeting of the Southport Town Council last Tuesday, Alderman Griffiths, in moving the adoption of the minutes of the Gas Committee, said the Manager (Mr. John Bond) had reported on the question of the Committee fulfilling their statutory obligations to the users of gas. Under the Order of 1902, the standard illuminating power was fixed at 16 candles; and under the Act of 1871, if the Committee failed to supply gas of less than 16-candle power they were liable to be prosecuted. The average result of 24 testings of the gas during the past month was 16·64 candles; and the average of four tests made in Birkdale was 16·24 candles. It was just possible that for an hour or two the illuminating power might be below 16 candles; but this was not a breach of their Order. On no occasion had any of their testings shown that they were not giving to the consumers what they were bound to do. Birkdale had statutory authority to make them pay if they did not do the right thing. The Gas Committee had that afternoon decided to appoint a Sub-Committee to go into this question and submit a report, as they were determined to demonstrate to those who used their gas that they were being supplied with good gas. Every complaint regarding the gas had the personal attention of the head of the department.

In

OCTOBER, 1907,

and since then, we have
consistently advertised that

Our "A.B.C." Gas Fires

5 DESIGNS, 14 SIZES,

Have Wearing Parts—Front, Burner, Guard, Brick, &c., Removable by Hand and Interchangeable, Fire with Fire.

¶ The demand has grown larger every year, and this season our sales for these Fires are **100 per cent.** more than any previous year.

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Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.
London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington.

Daylight Saving Bill.—A letter, signed by a large number of peers, Members of Parliament, clergymen, doctors, lawyers, and members of municipal bodies has been sent to "The Times," regretting that the Select Committee of the House of Commons to whom the Daylight Saving Bill was referred recommended that it should be proceeded with no further, and expressing the opinion that the conclusions of the Committee of 1908 in favour of the Bill were sound. The signatories point out that resolutions in support of the measure have been passed by 120 corporations and town councils, representing a population of more than 15 million, 46 chambers of commerce, 100 societies and institutions, and 39 trade unions. They further point out that a similar Bill introduced into the Legislative Assembly of Victoria, Australia, has been reported to the House within the last few weeks by a Select Committee with a recommendation that it should be passed into law.

Check on Extensions of Electricity Mains at Hastings.—On the strength of applications by two residents, the Electricity Engineer of the Hastings Corporation recently submitted a scheme for extensions of two mains involving an expenditure of £892; but he pointed out, in justification, that there was a possibility of getting other customers, while 15 gas-lamps on the route could be converted into electric lamps. A member (Mr. Cox) opposed the extension when it came before the Town Council. He said it was one of the greatest mistakes they had made when they passed a resolution sanctioning the conversion of gas-lamps to electric lamps wherever mains were laid, as they were thus sacrificing a good light for what was nothing better than a rushlight. There was not the slightest estimate of what amount of current would be taken by the two consumers mentioned; and, with regard to possible future consumers, they had already had some experience of this in Clive Vale. He moved that the matter stand over till a written undertaking had been obtained from intending consumers; and this course was agreed to.

Electric Light Failure Hinders Production of a Newspaper.—The following was in the "stop press" news of the Newport (Mon.) "Football Argus" on the 5th inst.: "In consequence of a failure of the electric light in High Street, Newport, part of the work of producing the 'Football Argus' had to be carried out by candlelight. A failure took place between five and six o'clock, and for a time the office, from basement to attic—literary department, composing-room, publishing office, and the front office partially—was in darkness. Candles were obtained as speedily as possible, and work was resumed in their dim light. The electric power was restored after a delay of about five minutes; but it failed again about 6.10 p.m., and work had again to be carried on by candlelight." The Newport Gas Company profited by the occasion of this failure of the electric light to insert a special advertisement in the columns of the "South Wales Argus" illustrating the claim made for gas lighting of "The Light that Never Fails." The advertisement was an illustration of a lighthouse, strongly built on a rock, throwing out its powerful rays over the sea.

Mitcham and Wimbledon Gas Company.—At the half-yearly general meeting of this Company next Tuesday, the Directors will report a sum of £16,769 available for distribution; and they will recommend the payment of a dividend at the rate of 5¼ per cent. per annum, less income-tax. In addition to the concession to the consumers by a reduction of 2d. per 1000 cubic feet in the price of gas as from Christmas last, the Directors have decided to abolish the charge hitherto made for cleaning incandescent burners, and to give free expert attention thereto, charging only for the materials used.

The Supply of Gas to Derbyshire Villages.—In reference to the proposed establishment of a gas-producing plant at Chinley, it is not the Matlock and District Gas Company, as a company, who are dealing with the project, but some people connected with this undertaking. It might be added that certain gentlemen financially interested in the Matlock and District Gas Company were the promoters of the Hathersage Gas Company—an undertaking which is reported to be making remarkable progress. So far as the Chinley scheme goes, matters are not yet by any means so far advanced as would appear from notices which have been published in the Press.

Gas Explosion in Selkirk.—An explosion of gas occurred in the gas-works at Selkirk at three o'clock last Tuesday week, which did a good deal of damage. The explanation is given that, owing to a little extra pressure from the purifier, a seal-pot in the scrubber-house blew out, and that the escaping gas accumulated in the house until it was ignited by a light outside the window. The side of the building—a stone wall—was blown down, and the roof fell in, breaking the piping to such an extent that the making of gas had to be suspended for an hour, until the Manager—Mr. D. Easson—was able to get some bye-passes instituted. There was, fortunately, no injury to any of the workmen.

Peking Water Supply.—The water-works of Peking, China, which were started about a year ago, have been completed, according to a recent United States Consular Report. The Shaho River, which rises in the hills west of Peking, and is an unusually clear stream, is the source of the supply. The pumping plant at Sunho consists of two centrifugal pumps having a combined capacity of about 5000 gallons per minute. The water is pumped first into three settling tanks, each 60 feet diameter and 16 feet deep, whence it enters ten sand and gravel filters, roofed with concrete. From the pumping-station water is forced through an 18-inch main to a covered reservoir at the Tung-chih-men, the north-east gate of the city. From this reservoir it is pumped into a 180-feet tower, holding 24,720 cubic feet, and thence flows through the city mains. If the tower should meet with an accident, the pumps can force the water to the residences; or should the pumping-station break down, the pumps at Sunho can fill the tower. In case both pumps and tower become unserviceable, the Sunho station can force water to the houses of the consumers. The pressure from the tower is said to be sufficient to throw a fire stream 120 feet high.

Large Cooker supplied to the

FARNHAM & DISTRICT GAS CO.

For use at THE CONVALESCENT HOME, HALE, FARNHAM.

We have an extensive range of Cooking Appliances suitable for

Public Institutions, Boarding Houses, Restaurants, Works' Mess-Rooms, &c., &c.

Your Inquiries will be esteemed.

THE PARKINSON STOVE CO., LTD.
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BIRMINGHAM:
Stour Street, Spring Hill.

LONDON:
129, High Holborn.

The Troon Corporation have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for telescoping their existing 68 feet diameter gasholder.

We learn from Mr. J. Jowett, the Managing-Director of Coalexld, Limited, that the German and American patents have been accepted, and that the material is being adopted by a larger number of gas-works.

The Directors of the Preston Gas Company reported to the shareholders last Friday that they had decided to put in new carbonizing plant at the Moor Lane works, and had entered into contracts with a view to the installation being completed during the summer.

The Lord Mayor of Liverpool has received a communication informing him that the Prince of Wales accepts the invitation of the Corporation to perform the ceremony of inaugurating the completion of the Vyrnwy Water-Works on Wednesday, March 16. The Water Committee will make arrangements for all the members of the City Council to be present at the function.

The latest novelty in the way of perpetual calendars which has been brought to our notice is one by the Sutherland Meter Company, Limited, of Witton, Birmingham. It takes the form of an excellent model (accurately coloured) of one of the firm's prepayment meters; but where the index and the number of the real meter would appear, apertures are left so as to show the date, day, and month.

While evening service was proceeding at All Saints' Church, Hawkhurst (Kent), last Sunday week, all the gas-lights suddenly went out, leaving the building in darkness. There was no panic; but the congregation had to be satisfied with the light emitted by a few candles.

A claim has, it is reported, been made by the Sunderland Corporation against Messrs. Laing and Sons, a local shipbuilding firm, for £22,500. Messrs. Laing and Sons, prior to their suspension a short time ago, agreed to take electricity from the Corporation to the amount of £1500 a year for fifteen years. To supply this, the Corporation erected a certain amount of plant; but after the firm had been taking current some little while, the works were closed. At that time, they owed the Corporation about £2000 for current; and altogether it was reckoned that the loss was not less than £4000.

As the result of the enterprise of Mr. C. V. Bennett, the Manager of the Herne Bay Gas Company, a show-room has been opened in the High Street of the town, where the residents are able to inspect artistic gas-fittings, gas-fires, cooker, and other appliances, as well as a selection of the best incandescent gas-mantles. According to a local paper, the "show-room presents a very tasteful appearance, and the whole place is an exhibition of home comforts." Outside are four three-light polished copper Welsbach inverted incandescent lamps, giving a light of 1500-candle power, and greatly improving the appearance of the street at this point.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

DRAUGHTSMAN. No. 5186.
JUNIOR GAS ENGINEER. No. 5182.
REPRESENTATIVE (OXIDE). No. 5180.
SOLE AGENCY (ANTI-CORROSIVE WATERPROOF PAINT). No. 5184.
WORKS MANAGER. No. 5181.

Situations Wanted.

ASSISTANT-ENGINEER. No. 5177.
SECRETARY, MANAGER, OR ACCOUNTANT. No. 5115.

Plant, &c. (Second Hand), for Sale.

GASHOLDERS, SCRUBBER, CONDENSER, STATION METER, EXHAUSTER, HYDRAULIC MAIN, PIPES, &c., &c. J. Harper and Co., Willenhall.
GASHOLDERS, STATION METER, GOVERNOR, AND EXHAUSTERS, &c. Chelmsford Gas Company.
GAS-WORKS (TWO) COMPLETE. No. 5185.
PURIFIERS, &c. Swansea Gas Works.
SCRUBBERS, WASHER, STATION METER, &c. Stockport Gas Department.

Plant, &c. (Second-Hand), Wanted.

STATION METER. King's Lynn Gas-Works.

Journals Wanted. No. 5183.

Stocks and Shares.

EAST HULL GAS COMPANY. March 1.
HORNSEY GAS COMPANY. March 1.
SOUTH ESSEX WATER COMPANY. March 1.
TOTTENHAM AND EDMONTON GAS COMPANY. March 1.

Meetings.

BROMLEY AND CRAYS GAS COMPANY. Offices, Feb. 22, Six o'clock.
HARROW AND STANMORE GAS COMPANY. Holborn Restaurant, March 4, Twelve o'clock.

TENDERS FOR

Coal.

DRONFIELD GAS COMPANY. Tenders by Feb. 22.

Boiler.

SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by Feb. 23.

Fire-Clay Goods.

CLACTON GAS AND WATER DEPARTMENT. Tenders by March 2.
RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 2.

Gun-Metal Fittings.

RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 2.

Gas Oil.

CARLISLE GAS DEPARTMENT. Tenders by Feb. 28.

General Stores (Lime, Acid, Compo. Pipes, Oils and Paints, Ironmongery, Books, &c.).

RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 2.

Meters.

RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 2.

Pipes, &c.

RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 2.

Oxide of Iron.

RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 2.

Retort Setting.

CLACTON GAS AND WATER DEPARTMENT. Tenders by March 2.

Tank for Gasholder.

SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by Feb. 23.

Tar and Liquor.

BOLTON GAS DEPARTMENT. Tenders by March 24.
CARLISLE GAS DEPARTMENT. Tenders by Feb. 28.
HAWORTH URBAN DISTRICT COUNCIL. Tenders by Feb. 21.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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For GAS PURIFICATION.
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PALMERSTON HOUSE,
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"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 129, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

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DONALD M'INTOSH,
110, CANNON STREET, LONDON.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, inc'ud'ng Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DEWSBURY.

OXIDE OF IRON.
(NATURAL.)
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
BALE & CHURCH,
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manu- facture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD., with which is amalgamated WM. PEARCE & SONS, LTD. 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd., NYMEGEN, HOLLAND.

General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON,

General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

"HALLITE" Asbestos High-Pressure Sheeting.
Hallite Douglas, Limited, 106, Leadenhall Street, London, E.C.

EDGAR OF HAMMERSMITH
FOR
STREET LIGHTING LAMPS AND ACCESSORIES.
Blenheim Works, London, W.
Telegrams: "Gasoso London." Telephone: 14 Hammersmith.

AMMONIACAL Liquor wanted.
Chance and Hunt, Ltd., Chemical Manufacturers, Oldbury, Worcs.
Telegrams: "Chemicals."

D. ANDERSON AND COMPANY, GAS LIGHTING ENGINEERS AND CONTRACTORS,
18 & 20, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "Dacolight London." Telephone: 2336 Holborn.

LUX'S GAS PURIFYING MASS.
See Advertisement on p. 397.
Friedrich Lux, Ludwigshafen-am-Rhein.

AMMONIACAL Liquor wanted.
Brotherton and Co., Ltd., Ammonia Distillers.
Works: Birmingham, Glasgow, Leeds, Liverpool, Wakefield, and Sunderland.

KRAMERS AND AARTS WATER-GAS PLANT.
K. & A. WATER-GAS COMPANY, LTD.
89, VICTORIA STREET, S.W.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
Works: Oldbury, Wednesbury, and Stafford.
Address Correspondence and Inquiries to Oldbury, Worcs.
Telegrams: "Chemicals, Oldbury."

METER INDICES
WITH AND WITHOUT DIALS.
A. ROUX & CO., Limited,
9, Southampton Street, Holborn, W.C.
MOVEMENTS FOR CLOCKS, PHOTOMETERS and BAROGRAPHS, WHEELS, PINIONS, and WORMS.
WORKS, HANDSWORTH, BIRMINGHAM.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
Read Holliday and Sons, Ltd., Huddersfield.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
Brotherton and Co., Ltd., Chemical Manufacturers, Works: Birmingham, Leeds, Wakefield, and Sunderland.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
Joseph Taylor and Co., Central Plumbing Works, Bolton.
Telegrams: Saturators, Bolton. Telephone 0848.

BRISTOL RECORDING GAUGES AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 28, College Hill London, E.C., and 25, Bridge End, Leeds.

AMMONIA.
Consumers in any form are invited to correspond with Chance and Hunt, Ltd., Chemical Manufacturers, Oldbury, Worcs.

J. E. C. LORD, Ship Canal Tar Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the enrichment of Gas.
Manufactured and supplied by C. Bourne, West Moor Chemical Works, Killingworth, or through his Agent, F. J. Nicol, Pilgrim House, Newcastle-on-Tyne.
Telegrams: "Doric," Newcastle-on-Tyne. National Telephone No. 2497.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

WARNER & VAN DER BIESEN,
ZWOLLE, HOLLAND.
Diggers and Suppliers of the
FINEST DUTCH BOG-ORE.
(Natural Oxide of Iron.)
Best Percentages. For lowest Quotations to any Port, Station, or direct into Works, please apply to—
London Offices: 6, LEATHER LANE, E.C.

TAR WANTED.
Telephone: Central Manchester, 7002.
Telegrams: "UPRIGHT."
Apply, THOMAS HORROCKS,
Albert Chemical Works, BRADFORD, MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, Feb. 1, p. 277.

GAS OILS.
MEADE-KING, ROBINSON, & CO. Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, Exchange Street, Manchester, and 11, Old Hall Street, Liverpool.

FIDDES-ALDRIDGE
SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges at One Stroke.
See Advertisement, Feb. 8, p. III. of Centre.
ALDRIDGE AND RANKEN,
89, Victoria Street, Westminster, S.W.
Telegrams: "Motorpathy, London." Telephone: 5118 Westminster.

PATENTS AND TRADE MARKS PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

"NUGEPE" GAS PLANT CEMENT.
JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the *best*. Satisfaction Guaranteed.

GAS TAR wanted,
Brotherton and Co., Ltd., Tar Distillers.
Works: Birmingham, Glasgow, Leeds, Liverpool, Wakefield, and Sunderland.

OXIDE OF IRON FOR GAS PURIFICATION.
Please Address Inquiries for Analysis and Prices to the
NEW WESTBURY IRON COMPANY, LTD.
WESTBURY, WILTS.

APPLICATIONS FOR APPOINTMENTS.
DO you appreciate how much success depends on well-considered and lucid presentment of your qualifications? I make a Specialty of the Preparation of Applications, and am continually receiving complimentary letters from clients. Write now for Particulars.
Herbert Greatorex, Hackney, Matlock.

MR. W. B. MIMMACK, for many years Secretary, Manager, and Accountant of the Crays Gas Company (111 Millions), now in Amalgamation, seeks APPOINTMENT in any or all of these Offices.
Address No. 5115, care of Mr. King, 11, Bolt Court, Fleet Street E.C.

ASSISTANT-ENGINEER and Manager, Excellent Qualifications, Works and Districts, SEEKS VACANCY in medium sized Works.
Address No. 5177, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

SOLE Agency to be given away, on Merchant Terms, of a Reliable ANTI-CORROSIVE WATERPROOF PAINT for Iron and Cement Surfaces, for the United Kingdom and some of the Crown Colonies. The Paint could be partly Manufactured in England. First-Class Testimonials.
Address Applications, with Trade and Banker's References, to No. 5184, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

A WELL-KNOWN Continental Firm, Established in 1885, wants a First-Class British Firm of Gas Engineers to REPRESENT them in the United Kingdom for the Sale of their High-Class OXIDE OF IRON for GAS PURIFICATION.
Address No. 5180, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WORKS Manager Wanted for Meter Works, thoroughly acquainted with Practical and Theoretical Meter, Governor, and Street Lantern Making. Must be a thoroughly Experienced Organizer.
Apply, by letter, stating Age, Experience, and Salary required, to No. 5181, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Junior Gas Engineer who thoroughly understands Photometry. One who has had Experience in a Gas Company's Testing-Room preferred.
Address, with full Particulars, stating Salary required, to No. 5182, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

DRAUGHTSMAN Required by a Firm of Contracting Engineers at their London Offices, Experienced in Coal-Conveying Plant and Similar Work.
Apply, by letter, stating Age, Experience, References, and Salary required, to No. 5186, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

"JOURNAL of Gas Lighting." Wanted to Purchase back numbers for May 8, May 15, and July 10, 1900; also May 19, 1903.
Address No. 5183, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, Second-Hand Station Meter. About 6000 Cubic Feet per Hour.
Particulars and Price to Smithard, Gas-Works, King's Lynn.

TWO GAS-WORKS FOR SALE.
TWO Village Gas-Works For Sale. Situated Five Miles apart.
For Particulars, Apply to No. 5185, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

GAS PLANT FOR SALE.
FOUR Cast-Iron Purifiers 8 ft. by 4 ft. by 3 ft. 6 in. deep, with Covers and Two Layers of Wood Grids. Centre-Valve, 6-inch Connections. Newly erected Three Years ago.
SCRUBBER, Vertical, 16 ft. to 18 ft. high by 2 ft. 6 in. to 2 ft. 9 in. diameter complete, fitted with new Elm Grids.
CONDENSER with Vertical Pipes.
Round STATION METER, with 6 Dial Index. Capacity 3600 Cubic Feet per hour. New Drum. In First-Class Order. Complete with Bye-Pass and all necessary Valves coupled to 6-inch. Main.
Also Two 6-inch Bye-Pass PLUG COCKS (new Three Years ago) for Two extra Purifiers.
EXHAUSTER for same, Belt Driven.
HYDRAULIC MAIN, ASCENSION PIPES, and Six Tangye's Patent MOUTHPIECES, all complete with Connecting Pipes, with all details.
Two GASHOLDERS—One with Standards, 15 ft. diameter by 12 ft. high approx.; one with Ashmore and Pease Chain balanced 13 ft. by 15 ft. approx.
Only just ceased work.
Address John Harper and Co., Limited, Albion Works, Willenhall, Staffs.

PURIFIERS.

THE Swansea Gaslight Company have for Immediate Sale—Four 20 feet Square by 5 feet deep PURIFIERS, with 24-inch Lutes, 18-inch Connections, and Centre Valve Complete. Immediate Removal.

Apply to the MANAGER, Gas-Works, SWANSEA.

GAS PLANT FOR SALE.

THE Chelmsford Gaslight and Coke Company have FOR SALE the following Second-Hand GAS PLANT:—

The whole of the IRONWORK of their Writtle Works, to be Dismantled shortly, including Two Small GASHOLDERS nearly new, also STATION METER and GOVERNOR, only used a few Years.

At the Chelmsford Works, for removal in April or May, Two EXHAUSTERS, of 15,000 and 10,000 Cubic Feet per Hour, respectively, made by Geo. Waller and Son, with all Connections and Valves.

ER. W. SMITH,
Engineer and Manager.

COUNTY BOROUGH OF STOCKPORT.

(GAS DEPARTMENT.)

FIRST-CLASS SECOND HAND PLANT.

THE Committee have for Sale the following PLANT, together with all Accessories, &c., for which they are prepared to receive OFFERS:

Two TOWER SCRUBBERS, 30 feet high by 10 feet diameter, with 16-inch Connections.

One STATION METER, capacity 40,000 Cubic Feet per hour, with 16-inch Connections.

One Kirkham, Hulett, and Chandler's "STANDARD" WASHER, capacity 800,000 Cubic Feet per Day, with 16-inch Connections.

The Plant may be Inspected and further Information obtained by Applying to Mr. S. Meunier, Engineer and Manager, Gas-Works, Portwood, Stockport.

Offers, endorsed "Second-Hand Plant," to be sent to the Chairman, Gas Committee, Town Clerk's Office, Town Hall, Stockport.

ROBERT HYDE,
Town Clerk.

Town Hall, Stockport.
Feb. 2, 1910.

THE Haworth Urban District Council are prepared to receive TENDERS for the Purchase of their Surplus TAR and LIQUOR for the Year ending March 31, 1911.

Tenders to be sent to me, endorsed "Tender for Tar and Liquor," not later than Feb. 21.

WILLIAM ROBERTSHAW,
Clerk.

Burlington Chambers,
North Street, Keighley.

DRONFIELD GAS COMPANY.

THE Directors invite Tenders for 1200 Tons of Best Screened GAS COAL, to spread over the Twelve Months ending April 30, 1911. The Coal to be Delivered as required.

Tenders to be sent to the Chairman by the 22nd inst., Sealed and Endorsed "Tender for Gas Coal."

HAROLD WHITE,
Secretary.

Gas Offices, Dronfield.

CLACTON URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

THE above Council are prepared to receive TENDERS for RE-SETTING Two Beds of REGENERATIVE RETORTS.

Copy of Specification and Form of Tender may be obtained of the Council's Consulting Engineer, Mr. Sydney Francis, A.M.I.M.E., Town Hall Buildings, Clacton-on-Sea.

Sealed Tenders, endorsed "Resetting Retorts," to be delivered to the undersigned not later than Noon on the 2nd of March, 1910.

The Council do not bind themselves to accept the lowest or any Tender.

GEO. T. LEWIS,
Clerk to the Council.

Town Hall Buildings,
Clacton-on-Sea.

RHONDDA URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

THE Council are prepared to receive TENDERS for the Supply of LIME, ACID, OXIDE OF IRON, RETORTS and FIRE-BRICKS, SILICA BRICKS, OILS and PAINTS, IRONMONGERY, &c., WROUGHT-IRON TUBES, GAS, WATER, GUN-METAL FITTINGS, GAS-METERS, HAULING, BOOKS, and STATIONERY as may be required for the Year ending the 31st of March, 1911. LEAD and COMPO. PIPES for the Half Year ending the 30th of September, 1910.

Forms of Tender may be obtained (except those for Gas, Water, and Gun-Metal Fittings, Lead and Compo. Pipes, Books, Stationery, and Ironmongery, which will only be supplied to those inspecting the Samples) on Application to Mr. Octavius Thomas, Engineer and Manager, Gas and Water Offices, Pentre, Rhondda.

No Form of Tender other than issued by the Council will be considered.

The Contractors will be required to pay the Standard Rate of Wages recognized in the District in each branch of trade.

Tenders, endorsed "Contract No. 1, &c.," as the case may be, to be addressed to the Chairman of the Gas and Water Committee, and sent to the undersigned on or before Ten a.m. on Wednesday, the 2nd day of March, 1910.

The Council do not bind themselves to accept the lowest or any Tender.

WALTER P. NICHOLAS,
Clerk to the Council.

Public Offices, Pentre,
Rhondda, Feb. 15, 1910.

SUTTON-IN-ASHFIELD URBAN DISTRICT COUNCIL.

GAS-WORKS EXTENSION.

PERSONS desirous of Tendering for the Construction of a Masonry GASHOLDER TANK, 105 ft. Diameter and 26 ft. 6 in. Deep, are requested to send their Names and Addresses to Messrs. Corbet Woodall and Son, Palace Chambers, Bridge Street, Westminster, S.W., not later than Wednesday, the 23rd day of February, 1910, together with a Deposit of £3 3s. (by Cheque) for Copies of Specification, Bill of Quantities, and Form of Tender. The deposit will be returned on receipt of a *bonâ-fide* Tender.

The Drawings of the proposed Works can be inspected at the Offices of the Surveyor to the Council, Outram Street, Sutton-in-Ashfield.

The lowest or any Tender will not necessarily be accepted.

JOHN D. FIDLER,
Clerk to the Council.

Council Offices,
Sutton-in-Ashfield.

SUTTON-IN-ASHFIELD URBAN DISTRICT COUNCIL.

GAS-WORKS EXTENSION.

PERSONS desirous of Tendering for a LANCASHIRE BOILER 20 ft. by 6 ft. 6 in., with Steam Piping, &c., are requested to send their Names and Addresses to Messrs. Corbet Woodall and Son, Palace Chambers, Bridge Street, Westminster, S.W., not later than Wednesday, the 23rd day of February, 1910, together with a deposit of £3 3s. (by Cheque) for Copies of Specification, Drawing, and Form of Tender. The deposit will be returned on receipt of a *bonâ-fide* Tender.

The lowest or any Tender will not necessarily be accepted.

JOHN D. FIDLER,
Clerk to the Council.

Council Offices,
Sutton-in-Ashfield.

CORPORATION OF CARLISLE.

TO OIL DISTILLERS AND OTHERS.

THE Corporation of Carlisle are prepared to receive TENDERS for the Supply of about 1000 Tons of GAS OIL Annually for a period of One, Two, or Three Years, commencing on May 1, 1910.

Specifications and Forms of Tender may be obtained on Application to the undersigned.

Sealed Tenders, addressed to the Chairman of the Gas Committee and endorsed "Tender for Gas Oil," must be delivered at this Office before Five p.m. on Monday, the 28th inst.

The Corporation do not bind themselves to accept the lowest or any Tender.

HAROLD E. BLOOR,
Engineer and Manager.

Gas Offices:
Victoria Viaduct, Carlisle.

CARLISLE CORPORATION GAS-WORKS.

TO TAR DISTILLERS.

THE Corporation are prepared to receive TENDERS for the Purchase of COAL-GAS and CARBURETTED WATER-GAS TARS for a period of One, Two, or Three Years, commencing on April 1, 1910.

Conditions and Forms of Tender may be obtained on Application to the undersigned.

Sealed Tenders, addressed to the Chairman of the Gas Committee and endorsed "Tender for Tar," must be delivered at this Office before Five p.m. on Monday, the 28th inst.

The Corporation do not bind themselves to accept the highest or any Tender.

HAROLD E. BLOOR,
Engineer and Manager.

Gas Offices:
Victoria Viaduct, Carlisle.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER, under the Authority of the Tottenham and Edmonton Gas Act, 1906

£30,000 "B" Consolidated Stock.

Minimum price, £111 per £100 Stock.

Tenders will be received up to Five o'clock p.m. on Tuesday, March 1, 1910.

The progressive character of the Company's Business will be seen from the following statement:—

Year ended Dec. 31.	Registered Consumers.	Price of Gas.	Dividend on "B" Stock.
			Per Cent.
1901	19,040	3s. 4d.	4
1902	22,505	3s. 0d.	4½
1903	27,070	3s. 0d.	4¾
1904	32,072	2s. 10d.	4¾
1905	37,363	2s. 10d.	4¾
1906	41,733	2s. 8d.	5
1907	45,691	2s. 6d.	5¼
1908	49,982	2s. 6d.	5¼
1909	53,785	2s. 5d.	5⅜

The full statutory Dividends have been paid for many years.

The price of Gas is now 2s. 4d. per 1000 Cubic Feet, and a Dividend of £5 10s. Per Cent. per Annum may therefore be paid.

Particulars of Sale, with Form of Tender attached, may be obtained at the Head Office of the LONDON AND PROVINCIAL BANK, LOTHBURY, E.C., or at any of their Branches, or will be forwarded on Application to me.

By order of the Directors,
E. TOPLEY,
Secretary.

Chief Offices of the Company,
High Road, Tottenham.
Feb. 4, 1910.

COUNTY BOROUGH OF BOLTON.

(GAS DEPARTMENT.)

TENDERS FOR TAR.

THE Gas and Lighting Committee of the County Borough of Bolton invite TENDERS for the Purchase of the TAR to be produced at their Works.

Further Particulars and Forms of Tender may be obtained on Application to Mr. William Walch, Office Superintendent, Gas Offices, Bolton.

Sealed Tenders, endorsed "Tender for Tar," and addressed to the Chairman of the Gas and Lighting Committee, Gas Offices, Bolton, to be delivered not later than Thursday, the 24th inst.

SAMUEL PARKER,
Town Clerk.

Town Hall, Bolton,
Feb. 11, 1910.

EAST HULL GAS COMPANY.

SALE BY TENDER OF £5000 NEW FIVE PER CENT. ORDINARY STOCK.

THE Directors Offer for Sale, by Tender, the above Amount of STOCK, to be issued under the Provisions of the East Hull Gas Act, 1906, and the various Acts incorporated therewith.

Since the year 1867, the Company has paid without intermission the Maximum Dividend allowed by Parliament.

The Dividend is Cumulative—*i.e.*, should the Profits of the Company in any one year be insufficient to pay the Maximum Dividend, the same may be made up out of the Reserve Fund or out of Surplus Profits in any future Year.

Any amount of Stock being a multiple of £5 but not less than £20 may be applied for.

The Stock will be allotted to the Highest Tenders.

A deposit of £10 per Cent. on the nominal amount of the Stock applied for must accompany each Tender, and the Allottees must pay the remainder of the Purchase Money on or before the 31st day of March, 1910.

LAST DAY FOR RECEIPT OF TENDERS, TUESDAY, the 1st DAY OF MARCH, 1910.

Forms of Tender and Particulars of Sale can be obtained at the Local Branches of Messrs. Barclay and Co., Limited, Bankers; or from the Offices of the Company.

By order of the Board of Directors,
DAVID WOOD,
Secretary.

Offices: Saint Mark Street,
Hull, Feb. 7, 1910.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

HORNSEY GAS COMPANY.

NEW ISSUE OF £5000 CONSOLIDATED STOCK,
£6500 FIVE PER CENT. PREFERENCE STOCK,
AND
£3000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 1, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTH ESSEX WATER-WORKS COMPANY.

ISSUE OF £20,000 NEW CAPITAL, COMPRISING
£5000 FIVE PER CENT. MAXIMUM ORDINARY STOCK,
£10,000 FIVE PER CENT. PREFERENCE STOCK
AND
£5000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 1, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

BROMLEY AND CRAYS GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the Company's Offices, 156, High Street, Bromley, Kent, on Tuesday, the 22nd day of February, 1910, at Six o'clock p.m. precisely, to receive the Report of the Directors; the Balance-Sheet certified by the Auditors; to declare a Dividend; to determine the Amount of the Auditors' Remuneration; to elect Three Directors and an Auditor, on retirements by rotation; and to Transact generally the Business of a General Meeting.

The TRANSFER BOOKS WILL BE CLOSED from the 7th of February to the 22nd of February, both days inclusive.

By order of the Board,
HENRY W. AMOS,
Secretary.

Offices: 156, High Street,
Bromley, Kent, Feb. 5, 1910.

HARROW AND STANMORE GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Proprietors will be held at the Holborn Restaurant, 218, High Holborn, London, on Friday, the 4th day of March, 1910, at Twelve o'clock precisely, to receive the Directors' and Auditors' Reports; to declare a Dividend; to elect a Director and an Auditor; and to transact any Ordinary Business of the Company.

The REGISTER OF TRANSFER BOOKS WILL BE CLOSED from Feb. 26 until March 4, both inclusive.

By order of the Board,
J. L. CHAPMAN,
Secretary.

Gas Office, Roxeth, Harrow,
Feb. 15, 1910.

CAST-IRON Pipes. Spigot and Socket or Flanged. Special Quality—9 feet or 12 feet Lengths. When buying, Write us.
A. LOWCOCK, Limited, SHREWSBURY.

GASHOLDERS—Splendid 45 feet diameter and New STEEL TANK, fixed Complete to Plan and Specification; also 14 feet and 16 feet Diameter GASHOLDERS, with STEEL TANKS. Can be seen temporarily erected. Re-erected Cheap for immediate Sale.
FIRTH BLAKELEYS, Thornhill, DEWSBURY.

Testing Instruments

ALEXANDER WRIGHT & CO., LD.
WESTMINSTER.

PYROPHORIC
GAS LIGHTERS.

Genuine Novelty.
Selling Splendidly.
"Presto," 7½", as illustrated, retails complete, 1/6;
"Pyros," for Shop Windows, 30" long, complete, 4/6.
Refills (5000 sparks) 9d. and 1/- each retail.
PAUL METZ (G. L. Dept.), 29, Newhall Hill, Birmingham.

Just Published. Second Edition. Re-written. Enlarged. 8s. 6d. *net.*

ACETYLENE:
The Principles of its Generation and Use.
By F. H. LEEDS, F.I.C., F.C.S.,
Member of the Society of Public Analysts and of the Acetylene Association; and
W. J. ATKINSON BUTTERFIELD, M.A., F.I.C., F.C.S., Consulting Chemist, Author of "The Chemistry of Gas Manufacture."
"Brimful of information."—*Chem. Trade Journal.*

Just Published. In Cloth. Illustrated. 12s. 6d. *net.*

THE GAS TURBINE
By HENRY HARRISON SUPLEE, B.Sc.
Prospectus is in preparation and may be had post free when ready.

LONDON: CHARLES GRIFFIN & CO., LIMITED, EXETER STREET, STRAND.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER
Gas Engineers' Agents and Contractors for
METERS, FIRE-CLAY GOODS, OXIDE OF IRON AND ALL OTHER GAS APPARATUS.
Inquiries Solicited.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

MIRFIELD GAS COAL.
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Sperm Value 878·85 lbs. per Ton.
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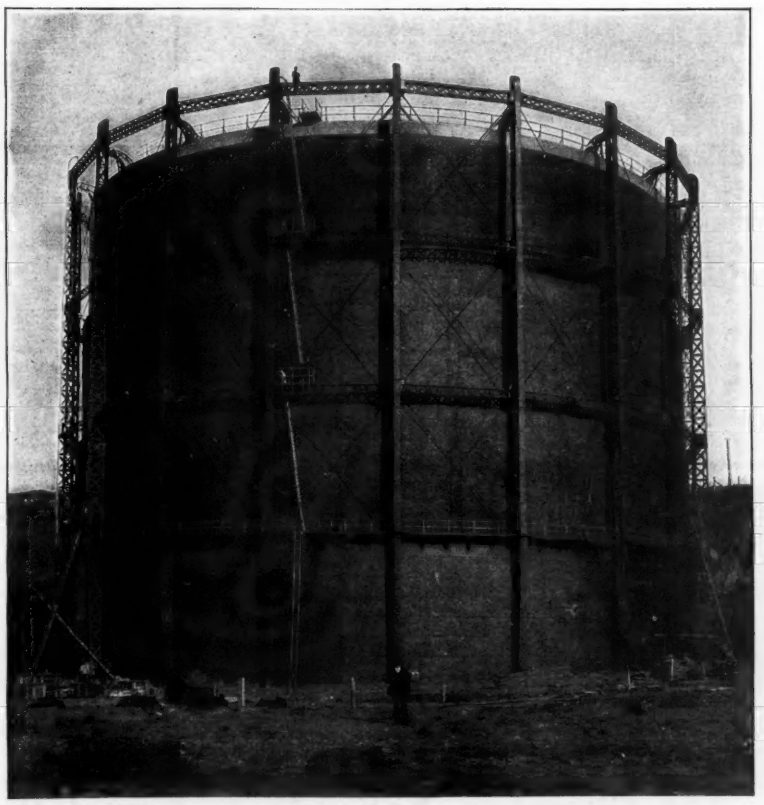

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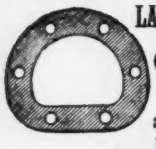

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"SAFETY STOP."

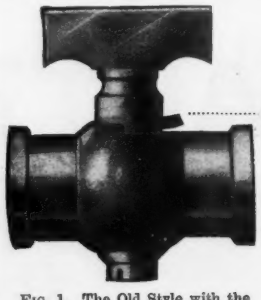

Fig. 1. The Old Style with the Old Trouble.
Note the Pin **A.**

Buyers of Gas Fittings are familiar with the trouble constantly arising through the Stop Pin of the Tap or Cock getting bent or broken, or falling out, thus leaving the Tap without a Stop, and leading to great danger of an escape of Gas.

EVERED'S PATENT
"SAFETY STOP"

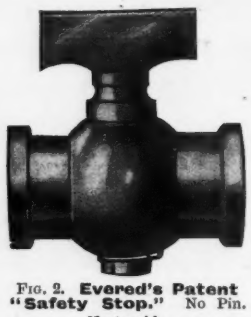

Fig. 2. **Evered's Patent "Safety Stop."** No Pin. No trouble.

renders the old Stop Pin unnecessary and is an absolutely **Safe and Permanent Stop.**

The projection shown in Fig. 3, marked **B,** working in the recess shown in Block, allows the Tap to be turned only so far as the recess extends. There is no possibility of the Tap turning further round as there is no Pin to become displaced or broken.

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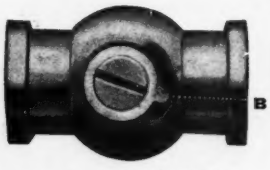

Fig. 3. Underside showing "Safety Stop" in lieu of Pin.

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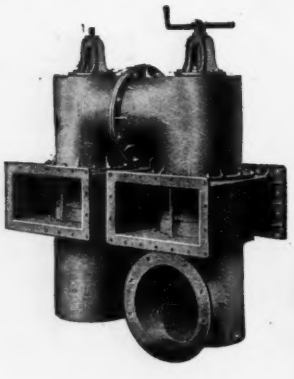

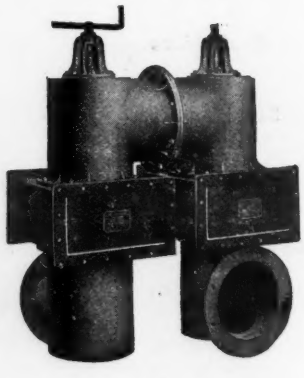

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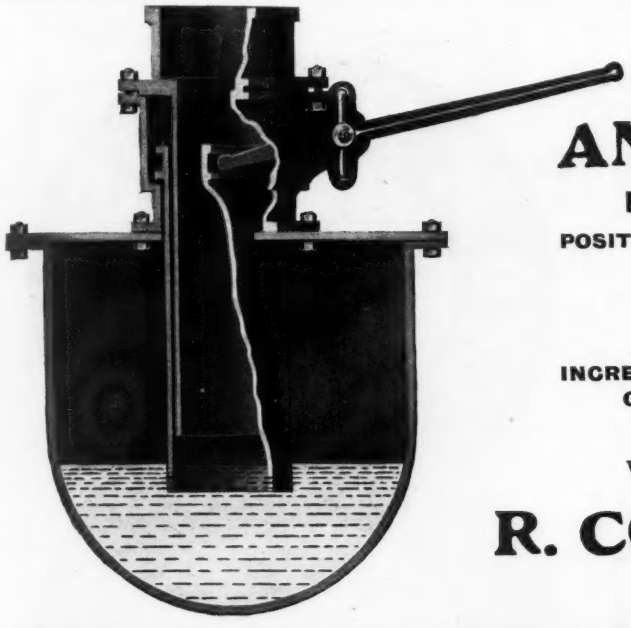

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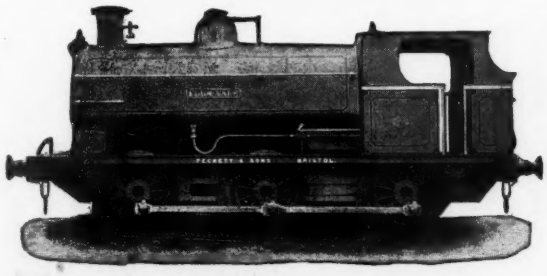

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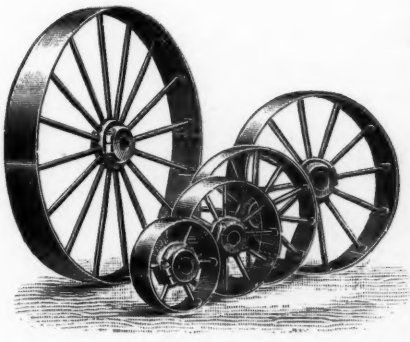

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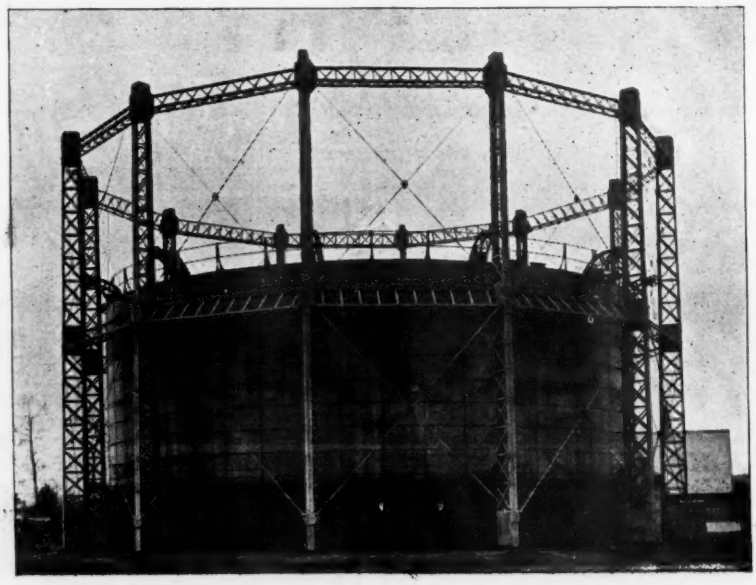

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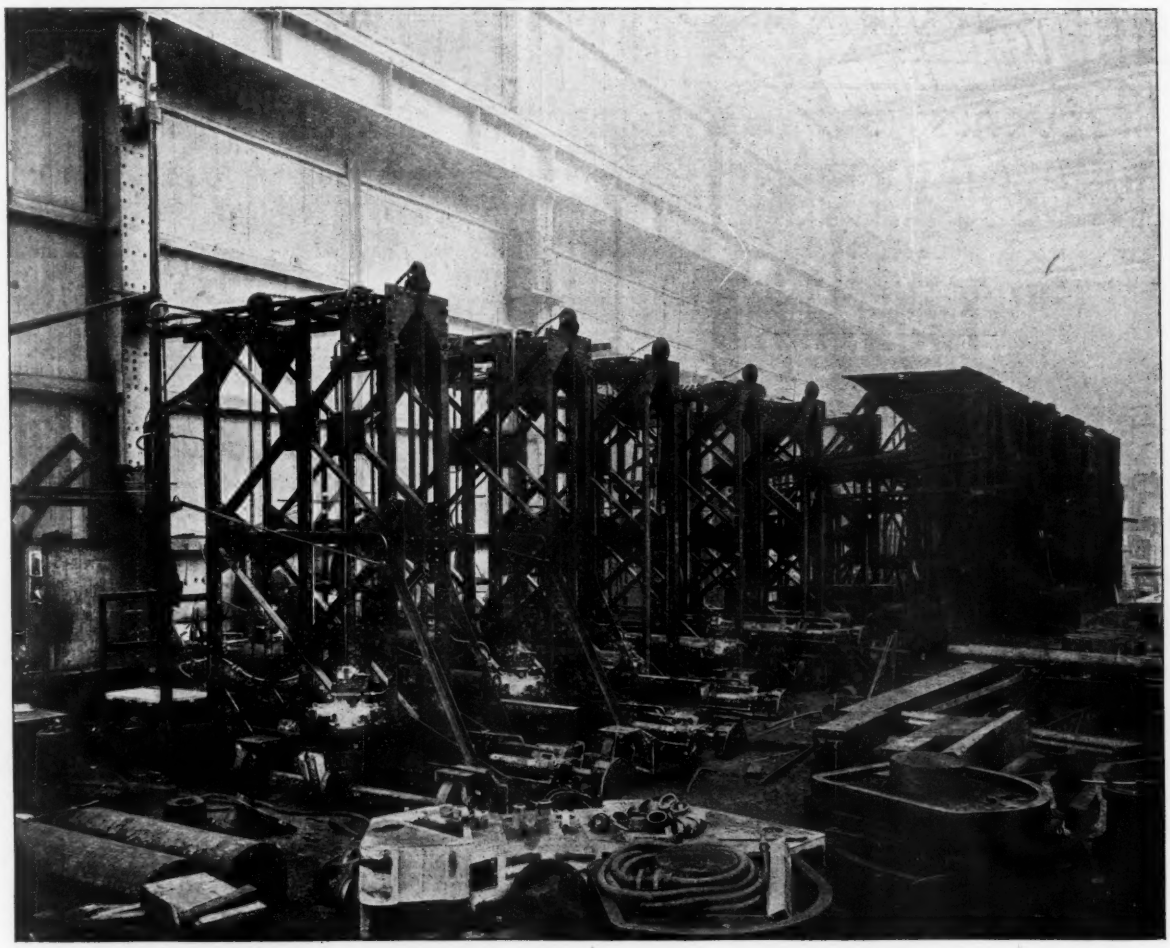

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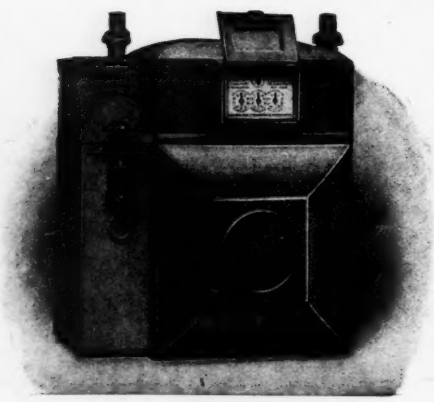

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Inverted Arc Lamp, Fig. 623.

Storm Proof—

For Exterior Lighting.

Welsbach-Kern

(Patent) Inverted System

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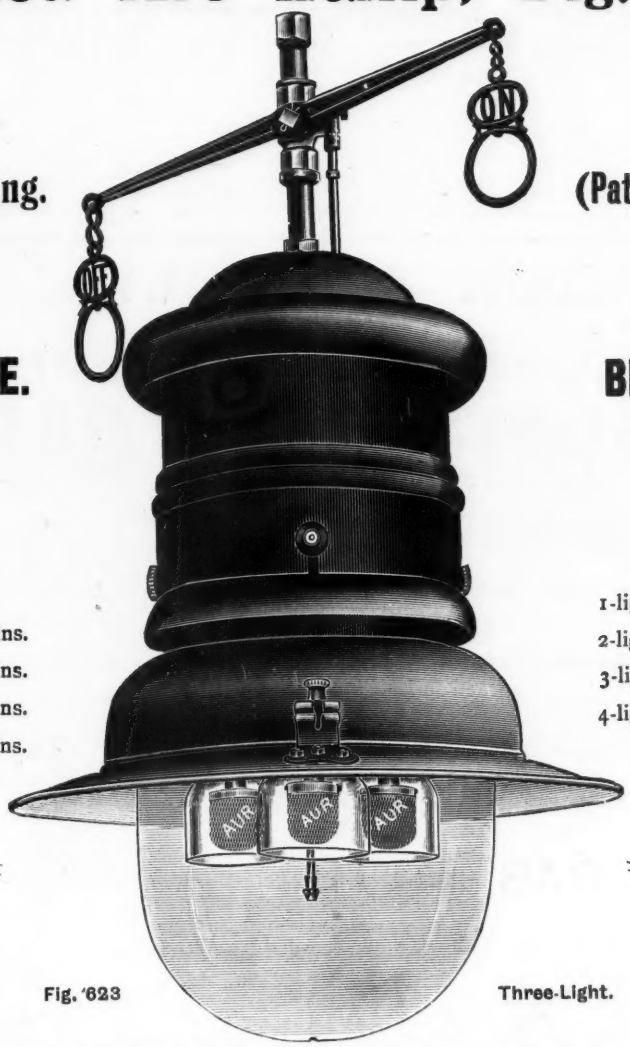

Fig. 623 Three-Light.

Height over all.

1-light . . .	1 ft. 8 ins.
2-light . . .	2 ft. 4 ins.
3-light . . .	2 ft. 4 ins.
4-light . . .	2 ft. 7 ins.

Width over all.

1-light . . .	1 ft. 1 in.
2-light . . .	1 ft. 5 ins.
3-light . . .	1 ft. 5 ins.
4-light . . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

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4-light	16 feet	550	**72/6**	**9/-** extra.

All on or off, or One light on and the rest off, **7/6** per Lamp extra. Cup and Ball, **3/6** per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) **3/4½** per dozen, or in case lots of 5 gross, **33/-** per gross.

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Clear Glass Globes, each	**2/3**	**5/9**	**5/9**	**9/-**
" " " In Case lots per dozen.	**19/6**	**57/9**	**57/9**	**93/-**
Case contains . .	*80*	*18*	*18*	*12*

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Wired Globes, extra each	**2/-**	**2/-**	**2/9**	**3/6**
Parabolic Reflector, extra "	**3/6**	**6/-**	**7/6**	Not made

Welsbach Mantles, each **6d.** subject as usual.

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price **4½d.** each.

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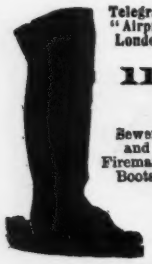

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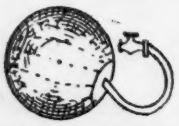

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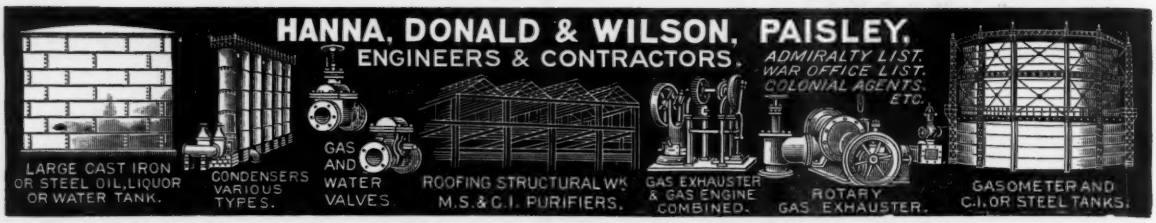
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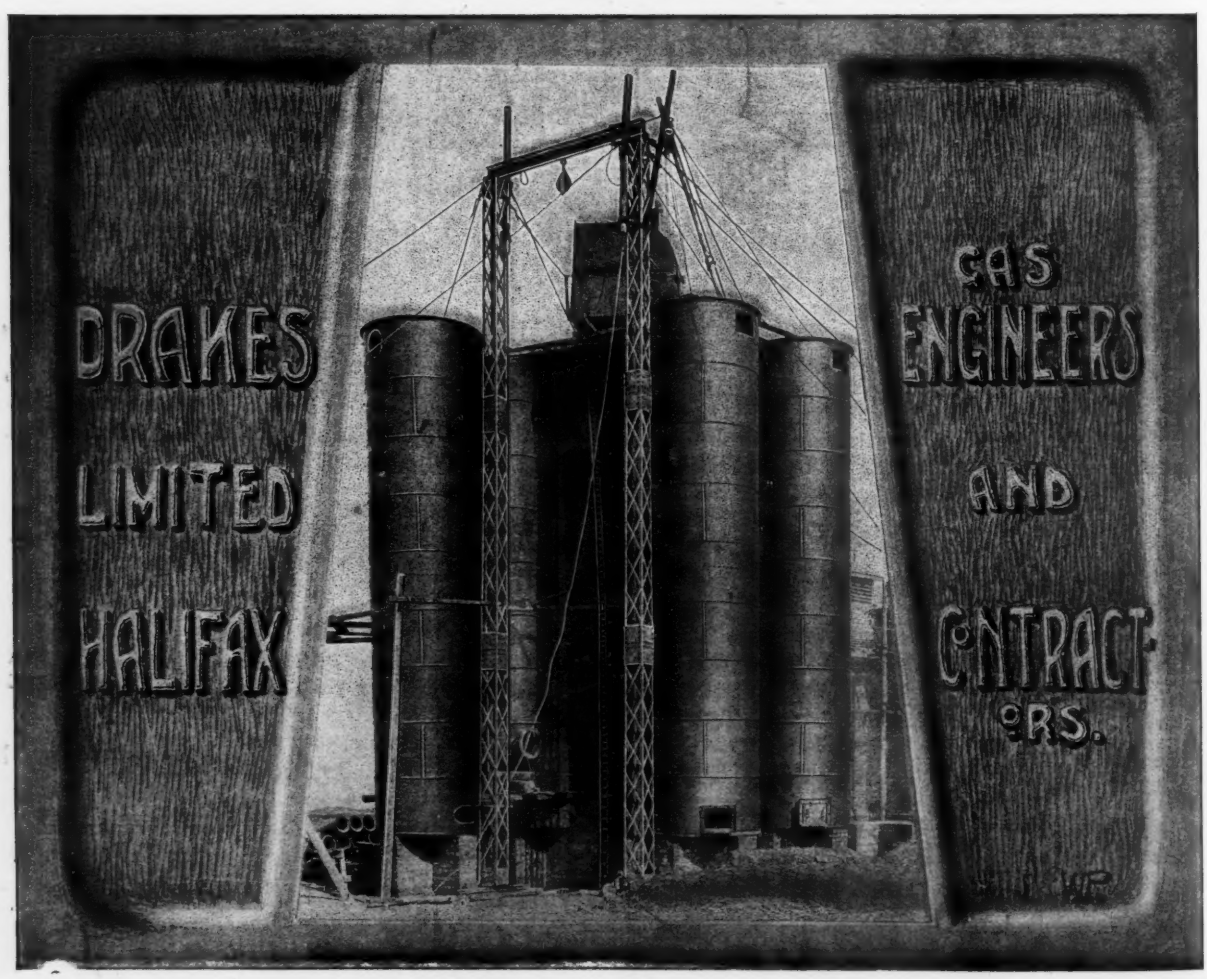

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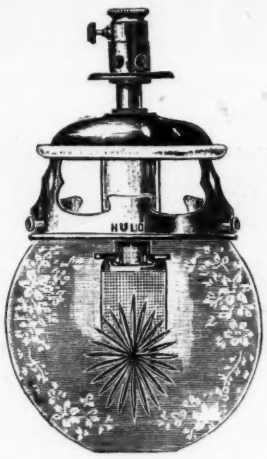

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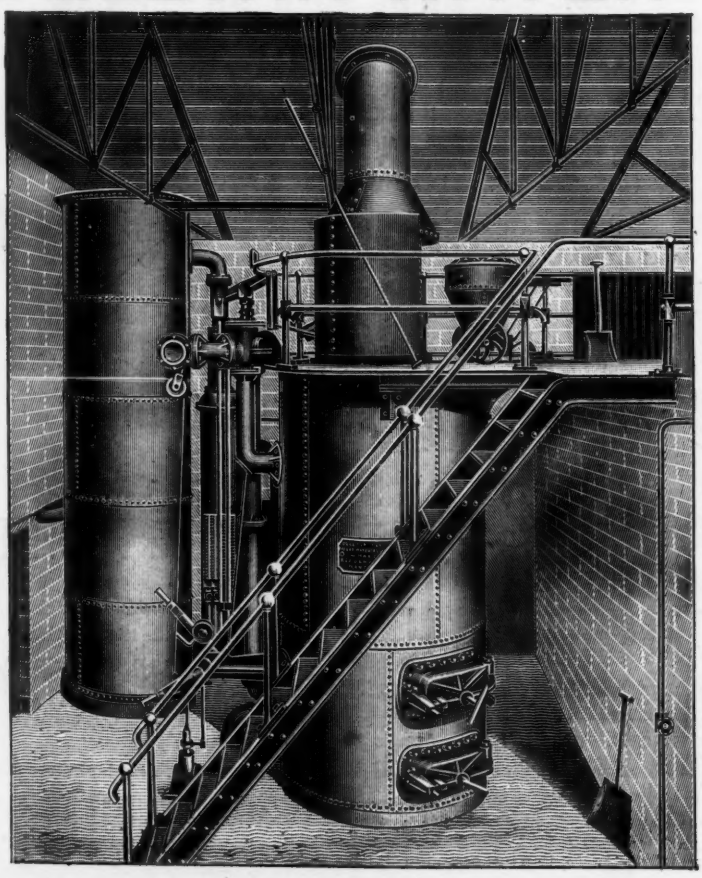

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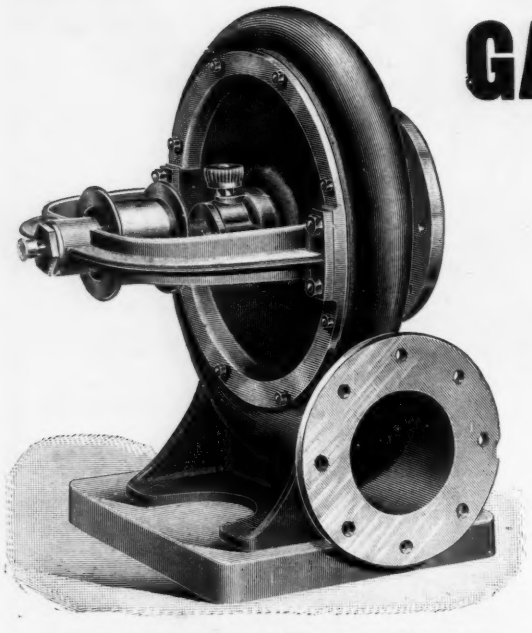

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